



Presentation on the case study of China-Africa RET project  
(中国-非洲新能源项目的案例分享)

China-Ghana Experience Sharing Workshop on Renewable Energy Technology  
中国-加纳可再生能源技术转移南南合作项目

Ghana  
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Bringing Green Power to Life

## Water access condition in rural areas of Africa



- How to have access to clean drinking water
- How to liberate the rural women from heavy manual work

## 1. Usage situation of existing water wells in Niger 尼日尔水井使用现状

- In recent 20 years, UN and World Bank donated funds to build water well as a water solution for Niger's rural areas, even some were equipped with pumps and small diesel generator
- **However lot of water wells weren't well used by local people, even few were abandoned**

- Problem in getting sustainable funds to fuel the diesel generators
- Lack of professional personal to maintain the equipment

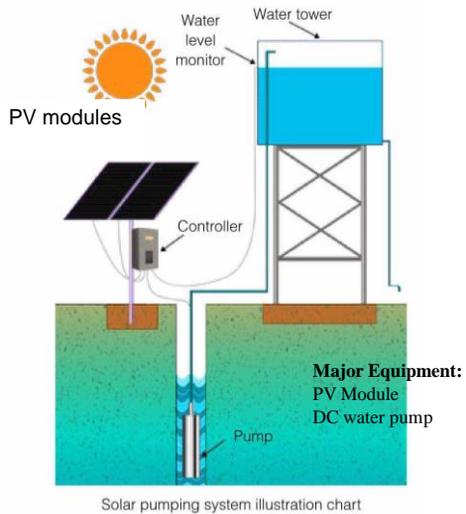
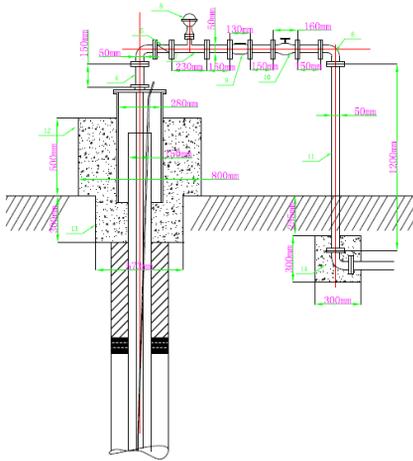


## 2. Background of the Project 项目背景

- Transform the existing water wells by solar pumping system in Niger's rural was a business initiative of the Africa Company. Meanwhile, by coincidence, the Ministry of Water Resource lunched a plan to improve the usage rate of existing 500 wells in Niger's rural areas and the solar pumping system's a solution that the authority was looking for.
- Agreements of "cooperation in implantation of 500 solar pumping systems in Niger" signed between The Ministry of Water Resource and The Africa Company.
- The agreements were firstly implemented by introduce 3 experimental project (solar pumping system) to Koss at the request of the authority.



### 3. Program Design 设计

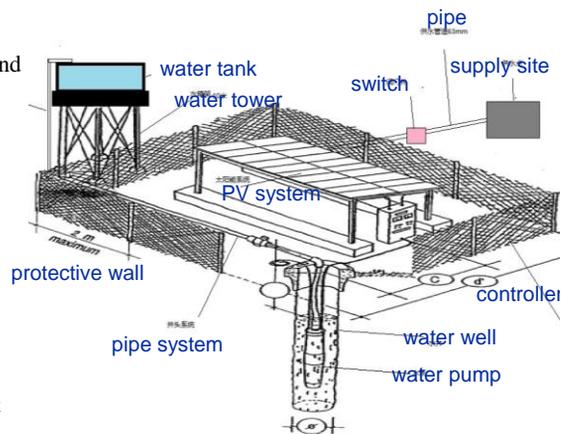


- Renovation of the unused wells, then install the solar pumping system



### 4. Construction 建设

- well clean up
- Water quality test
- Construction the base of the water tank and water tower
- Installation the tank on water tower
- Installation the photovoltaic system and pumping system
- Installation the pipe system
- Construction the water supply site
- Construction the protective wall
- Disinfection works and water quality test
- Operation and personal training (for maintenance)



Construction drawing of the system 系统建设图纸



## Work Completed Project 完工项目



## 5. Financing and Return on Investment 融资和投资回报

The Koss's solar pumping system is a business innovation of a private company, which means the financing and Return on Investment need to take into consideration.

### 5.1. Financing 融资

- Banking loan for initial equipment purchase and construction from the Export- Import Bank of China
- Investment from the NGOs and other NPOs
- Fund raised from the project users (local people)
- Subsidiary and other supportive measure from the government side



## 5.2. Return on Investment 投资回报

- Transaction of asset to other commercial operators
- Income from the water bills payments
- Aid fund from the foreign governments, NGOs and other NPOs



## 6. Key factors to achieve the program's success 为取得成果所做经验总

- Supportive measures from the local government
- Clear strategic roadmap of the program from the government side
- Innovative business models and incentive for involvement of private sector
- **Risk mitigation 降低/防范风险**

- Risk in payment receiving form system users
- Risk in changes of supportive policy/ measures from the government
- Risk in taxation
- Risk in investment security
- Risk in human resources: lack of professional personal to operate and maintain the system



## Niger impalements the well transform project by PPP cooperation 尼日尔采取公私合营的方式实施饮水井改造项目

On October 26, Niger's Ministry of water resources signed the contract with The Africa Company, which aims to equip the 500 water wells with solar pumping system equipment. The projects will be implemented through public-private partnerships (PPP) forms, and the initial investment is around \$ 46.38 million.

The initial investment shall be provided by the private side, as a loan offering to the government who agrees to pay the principal in 12 years. And the interests of this 12 years loan will be paid by the system users through a fund named “universal drinking water access fund”.

The Niger's government cares the drinking water necessary of its people in rural ,between 1981-2014 more than 15,000 more than the water well was dug. The above program will benefit more than 500,000 people once completed.



## The Solar Power Application Demonstration Program For 1000 Villages 尼日尔千村项目

- The ministry of energy was asked by the Africa Company to choose 3 village for implementation of “the PV application project in rural”;
- The Africa Company presented a program design for 100 villages ;
- Agreement of the “**The Solar Power Application Demonstration Program For 1000 Villages**” signed between Ministry of Energy and The Africa Company;
- The project implemented in Dosso was highly accepted and welcomed by the Niger's government;

### Financing 融资

- Investment from the Niger's government side or bank loan from local bank;
- Credit of favorable condition from oversea banks or aid fund from foreign government;
- Investment from the private company
- Fund raised by local people themselves



## The Solar Power Application Demonstration Program For Dosso village

The project in Dosso named “The Solar Power Application Demonstration Program For Dosso village” is a begging and experimental project of the “1000 Villages” program.

- Project for daily life



Domestic system for rural family in Dosso

- Project for school



Solar air fan in school located in Dosso



## The Solar Power Application Demonstration Program For Dosso village

- Freezer system
- Street lighting system



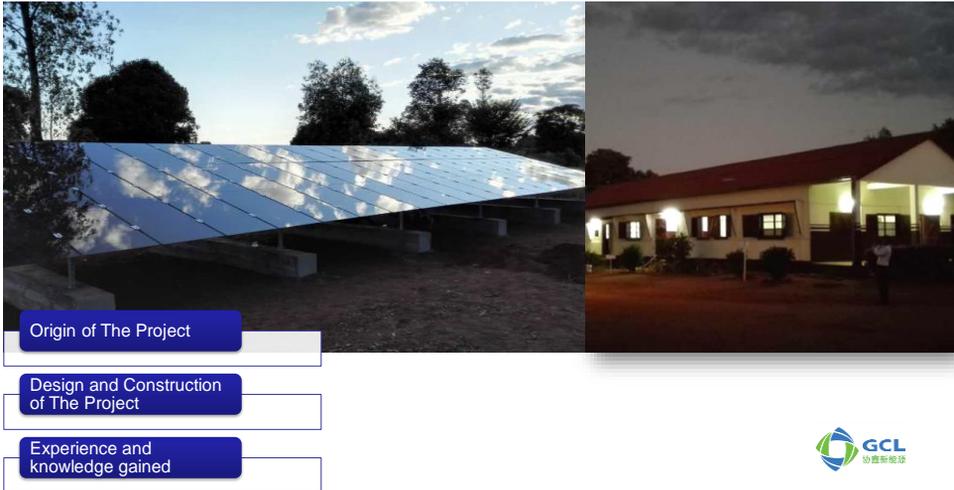
Solar lamp



Solar freezer system in Dosso village



## Sakay Hospital's off-grid photovoltaic system in Madagascar



### 1. Background of The Project 医院最大困难 (系统安装前)

**Main difficulty for the hospital's operation (before installation of the system- no electricity)**

The Sakay Hospital's off-grid photovoltaic system (The System) is located in Sakay, a no access of public grid area in a district near the nation's capital. Before the installation of the system, the only electricity source of the hospital is a very small diesel generator prepared for emergency use. The daily operation of the hospital is largely limited by lack of electricity, especially for some medical/ surgery equipment and usually at night the hospital is nearly paralyzed.

- No Access to Electricity
- No Self- Sufficient Power Generator
- Operation's Limited by Shortage of Power
- Enough Solar Radiation

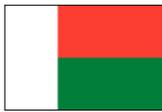


Project location

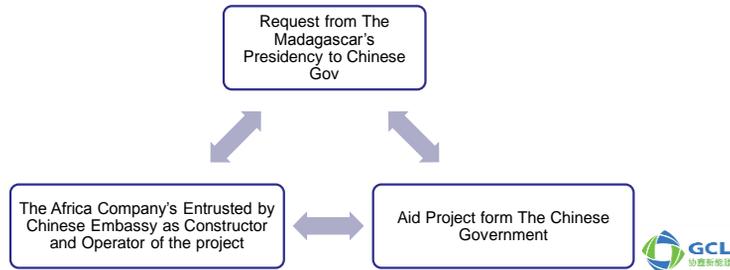


## 1. Origin of The Project 项目由来

At the request of Madagascar's President and First Lady to Chinese Embassy to set a solar power system in Sakay Hospital as an aid program from Chinese government, the Africa Company was finally selected as the equipment supplier, project constructor and operator.

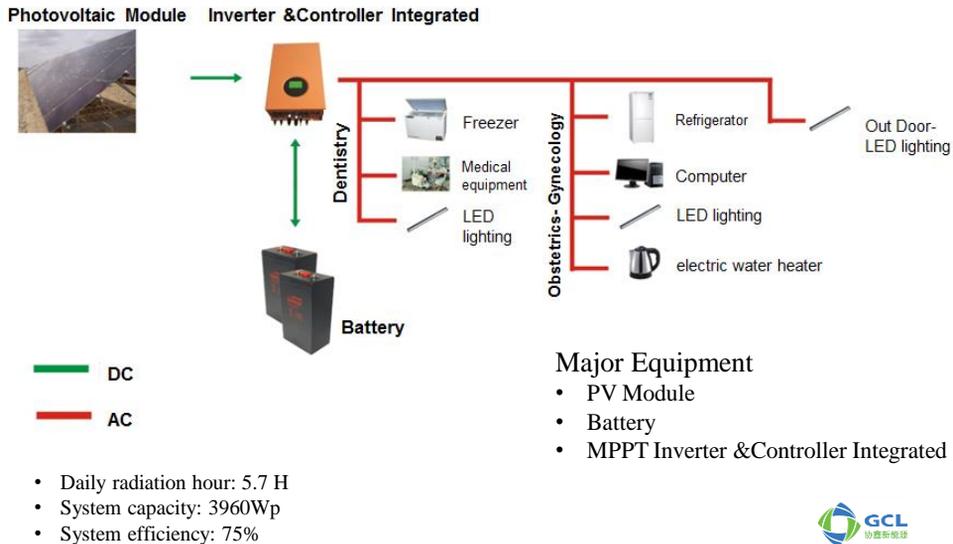


\* Funding: the investment for the project was came the Chinese government's foreign aid project budget.



## 2. Design and Construction of The Project

### 2.1. Structure of the system



## 2. Design and Construction of The Project

### 2.2. system out-put 系统发电

**Daily radiation hour:** 5.7 H

**System capacity:** 3960Wp

**System efficiency:** 75%

**Energy storage:** The daily electricity consumption of the hospital is around 13.56kWh, 16 batteries in series can meet at least 2 day's energy demand in case of continuous rainy days.

Month	Generating Hours	Electricity Generated (kWh)
JAN	174.95	519.59
FEB	157.50	467.78
MAR	170.45	506.24
APR	169.40	503.12
MAY	160.68	477.23
JUN	151.33	449.45
JUL	161.28	479.01
AGU	184.96	549.34
SEP	201.34	597.98
OCT	198.13	588.43
NOV	175.60	521.54
DEC	167.40	497.17
Annual Accumulated	2079.40	6156.89



## 3. Spectacular point of the design 设计亮点

- Design and construction that based on the actual needs and real condition of the target assisted.
- Human centered design concept .
- Aid project with the sustainable maintenance income produced.



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- **Replacement of the high power LED lamps**

The 50W LED lamp in the design was changed by the 20W one, in order to reduce the cost of the project and save energy in the future.



- **Adding the electric water heater**

Before the installation of the system, the hot water used to deliver the baby in the hospital was boiled by the burning woods that even couldn't meet the hospital's water demand during the bad weather day. The design team proposed to have an electric water heater to guarantee the delivery women and their babies' health.



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- **The new freezer added**

- A new freezer was added in order to make ice bag for cooling down the body temperature of the patient;
- The ice water made by the freezer is sold to local people which can bring some income for system's future maintenance.



- **The USD charging plugs added on the freezer**

- In order to provide the cell phone charging service for the visitors, the design team added 20 USD charging plugs on the freezer.
- The cellphone charging fees serve as a income for the system's future maintenance.



## 4. Support from the government 政府支持

- Appropriate program selected by the government
- Assistance and cooperation provide by the government
- Tax exemption for the project
- Involved in the professional personal training



## Domestic PV system in Capo Verde



1th domestic PV system in capital city of the Capo Verde  
System capacity: 1.3 kWp  
Type: independent PV system with battery



2th domestic PV system in capital city of the Capo Verde  
System capacity: 1.3 kWp  
Type: independent PV system with battery



## Business and investment returns 商业模式和资金回

**收**  
The domestic PV system was intruded to Cape Verde in a total commercial way by the Africa Company, without any connection to government aids etc, the target of the system was mainly private consumers. The Africa Company was an equipment provider in Cape Verde market, well also provided the system design, installation service, maintenance service for its clients.

- **Payment terms: 支付要求**

To ease the payment burden of the clients, the payment of the system is mainly divided into 2 parts: down payment and installment payment

- 30% down-payment paid by the client within 2 weeks after signing the contract.
- The Africa Company transports the equipment after receiving the down payment.
- The balance's paid by 5 installment payments after the installation/ or the balance can be paid monthly by 24 installment payments in 2 years after the installation .
- The client should provide the certificate of their real-estate as a guarantee for mortgage payment.



## Experience gained 经验分享

Despite the high electricity cost and demand for PV solar system from the market side, the widely commercial promoting of the domestic system facing serious roadblocks.

- **Technical roadblock 技术上的障碍**

Unstable power grid which impossible the integration of the domestic PV system to the grid.

- **Deficient from government supportive measure 政府支持不到位**

- Tax risk: 税收风险

Despite the import tax exemption for the PV module, the rest of the equipment's charge 10-30% of import tax; besides the 15.5% of the VAT's charged over every equipment including the PV module; what's more, other import fees such as "Eco-fee" is charged over each product (eg: the "Eco-fee" of the battery is 1 EUR/ KG, which traps the promotion of the off-grid system.). The equipment cost after tax of the system's 2.5-3 times of its CIF cost.

- Deficient in incentive policy: 激励政策不到位
- No practice of the renewable energy subsidiary from the government.
- No policy and its execution that guarantee the payment of power integrated by domestic PV systems.



- **Grid doesn't permit the integration of the domestic PV system 系统不被许可上网**

Disincentive the integration of the domestic system onto grid (no payment for power integrated by system users.)

- **Deficient in human resource 人才不足**

Lack the professional personal to maintain the system.

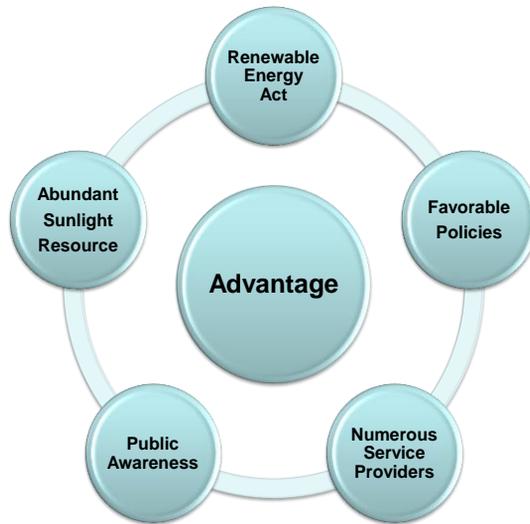
- **Overload operation from the client side 客户超载运行**



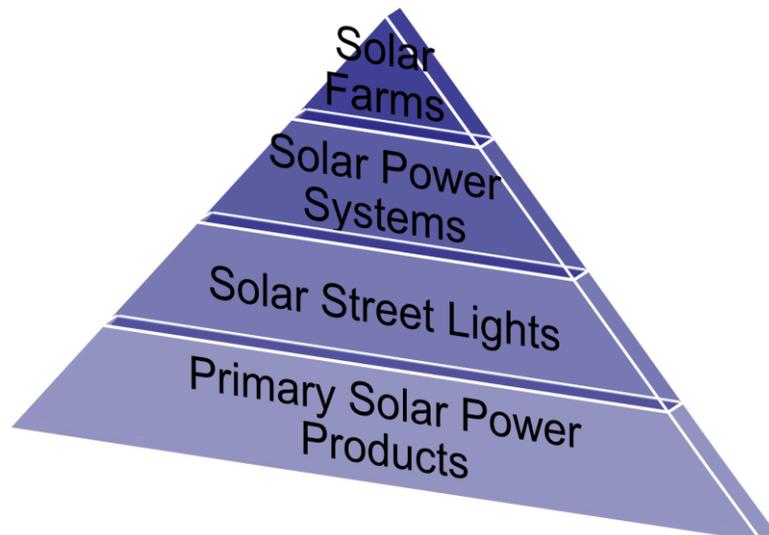
## Solar Energy Development in Ghana



## 1. Driving Force on Solar Energy Development in Ghana



## 2. Prevailing Utilization Forms



### 3. Completed Rooftop Project Introduction

#### Commons of Clients

##### Understanding

- Beneficiary from Solar Power
- Limitation on Solar Power

##### Payment Ability

- Steady Job
- Relatively High Income

##### Clients' Source

- Employees and Organizations
- Commercial Entities Are Rare

##### Concerns

- System Reliability and Durability
- Cost
- Flexible Payment (mortgage)
- After-sales Service



### 3. Completed Rooftop Project Introduction



**2.6 kW Of- Grid Solar Power System**

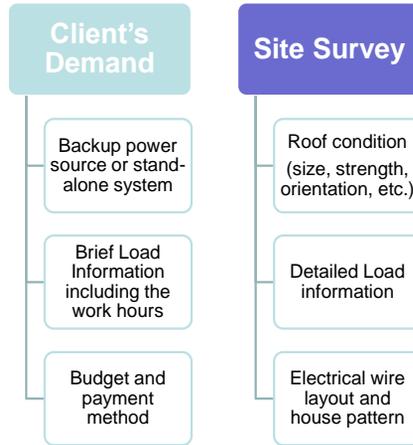
Client: Individual

Occupation: Bank Employee



### 3. Completed Rooftop Project Introduction

#### (1) Client Visit and Site Survey



### 3. Completed Rooftop Project Introduction

#### (2) Solar Power System Design Confirmation

<b>Load Brief</b>	<b>7 bedrooms, 3 living rooms, 3 kitchens Include more than 30 lights, 8 ceiling fans, 3 fridges and 5 laptops</b>	
<b>Recommended System</b>	<b>2.6kW Solar Power System with automatic switch between the grid and solar power</b>	
<b>Major Components</b>	<b>Type</b>	<b>No.</b>
PV Module	110Wp	24 pieces
Battery	12V 100Ah	14 pieces
MPPT Inverter & Controller Integrated	3000W	1 unit

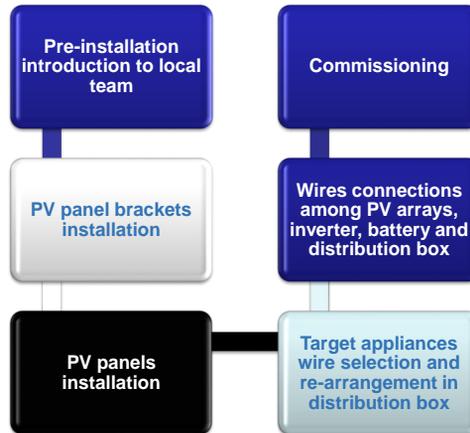
Daily average generation volume: 10.4 kWh



### 3. Completed Rooftop Project Introduction

#### (3) Solar Power System Installation

The installation work takes 2 technicians and 3 assistants workers for 4 days to be completed. The big incline of the roof increases the difficulty on PV panels installation.



### 3. Completed Rooftop Project Introduction

#### (3) Solar Power System Installation



Installation process



### 3. Completed Rooftop Project Introduction

#### (4) After-sales Service

##### Routine Check

- The service team takes routine system check every 2 weeks

##### 24 Hours on Call

- Once receiving the service request from clients, the service team visit the clients within 24 hours.

##### PV panels Cleaning Service

- Upon the request from clients, the service team provides PV panels cleaning service to maintain high efficiency of solar power systems.



### 4. Other Completed Rooftop Projects Demonstration



#### 1.3kW Off-Grid Solar Power System

Client: Individual  
Occupation: Government Employee

#### 1.3 kW Off-Grid Solar Power System

Client: Individual  
Occupation: University Professor



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## 5. Problems Solar Energy Development is facing in Ghana

- High Cost on Bank Finance
- Substandard Solar Energy Products
- Limited Utilization Field and Low Commercial Value Output
- Unstable Electricity Grid



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## 6. General Advices

- Further Tax Incentive to Solar Energy Industry
- Rational Government Subsidy Allocation
- Supervision Improvement on Primary Solar Power Products



## 7. Advices on Distributed Solar Power Development

- Policy Guide
- Creative Finance Support
- Pilot Projects



协鑫新能源控股有限公司  
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谢 谢  
Thank You!

Bringing Green Power to Life