

الطريق

# Solar energy for rural development



By: Omar M. Hosny

# Who am I?

- Chief Technical Officer  
KarmSolar
- Technical Adviser  
Renewable energy and energy efficiency  
JCEE – GIZ
- Member of the advisory board  
PRO-GREEN Diploma  
American University in Cairo
- Initiator and project manager  
Tanweer el Heiz rural development project



**giz**

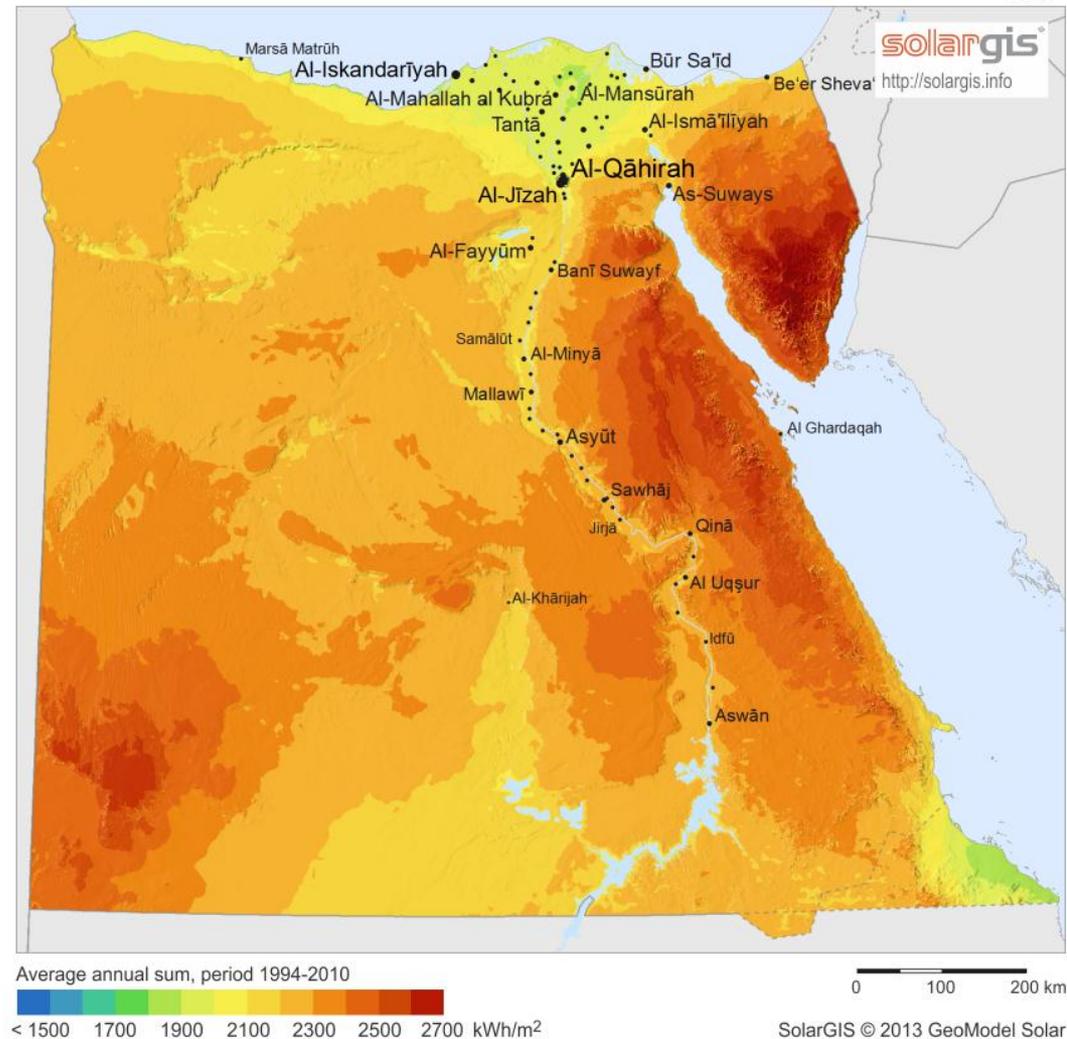


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# Solar resource in Egypt

Direct Normal Irradiation

Egypt

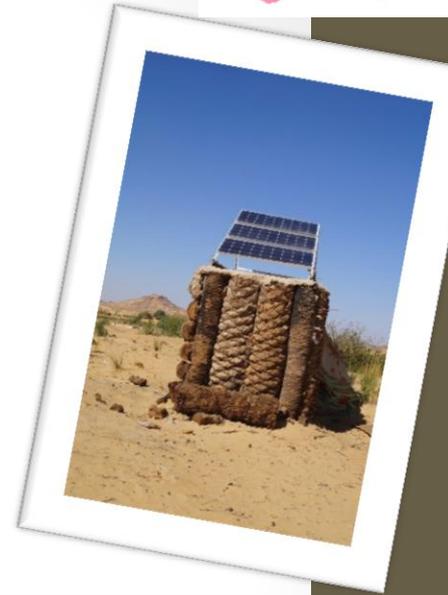


- 1750 – 2700 KWh/m<sup>2</sup>
- 5 – 6 PSH per day

Solar GIS online: <http://solargis.info/>

# Project components

- Solar Electrification
  - 62 households
  - 6 mosques
  - 2 small poultry farms
  
- Solar Water treatment
  - 15 m<sup>3</sup> per day
  
- Water canal lining
- Introducing modern irrigation techniques
- Training and capacity development



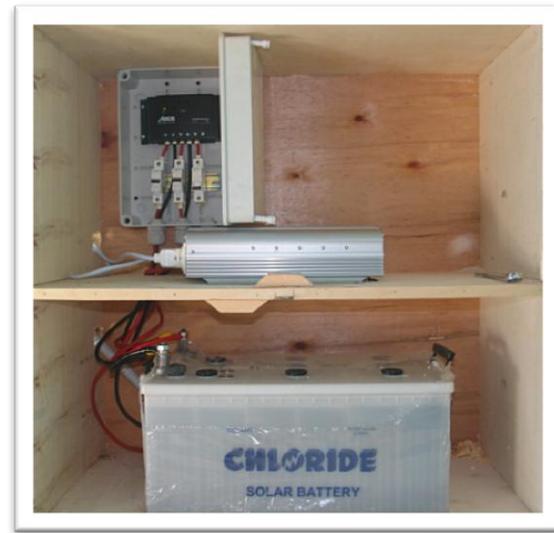
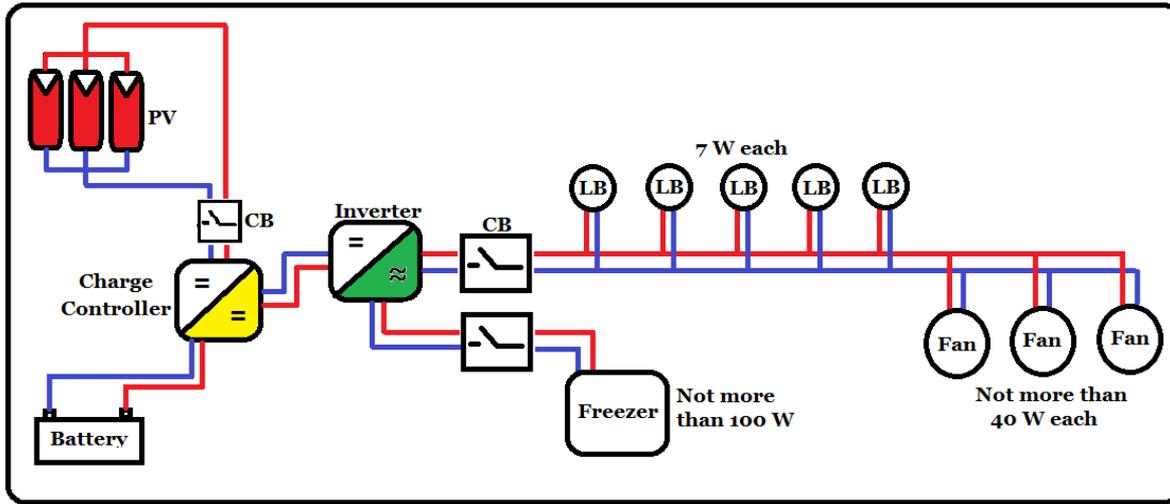
# Solar Home systems

- The project started in July 2012
- Each household gets:

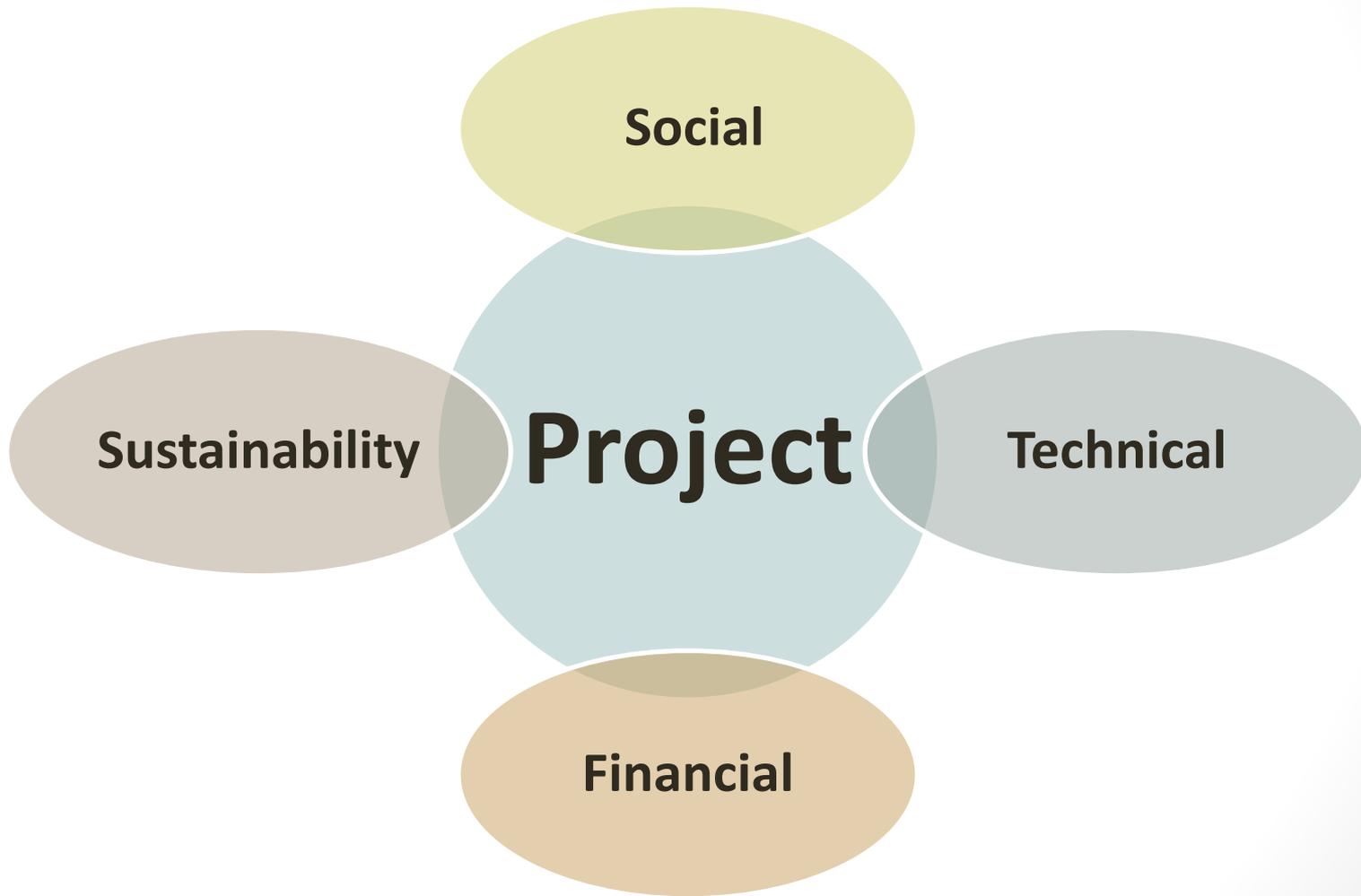
System Components	Energy enough for
420 Wp panels	6 CFLs
260 Ah batteries	1 Freezer
30 A controller	1 TV
Mounting and BoS	1 Charger
	2 Fans

- Work on the ground is done by volunteers and locals

# System Design



# Challenges



# Economics of PV systems

- Applications with storage (small – medium scale)
  - USD per watt 3.5 to 6

78 KWp installed on remote village

**Payback over 6 years @ 5.5 \$/Wp**

- Applications Without Storage:
  - USD per watt 2.5 to 3 for off-grid solar pumping

Solar high capacity pumps

35 KW pump with a 42.5 KWp solar field

**Payback over 4 years @ 3 \$/Wp**

- On grid 1 MW Scale:
  - LCOE @ 0.8 to 0.95 \$ per KWh (For client owned model)
  - LCOE @ 1.2 to 1.35 \$ per KWh (for PPA)

# PV SPOT prices 12-3-2014

## Module

2014/03/12 update

Item	High	Low	Avg	Chg	Chart
Module Price (Per Watt)	0.90	0.53	0.660	– (0 %)	

## Thin Film

2014/03/12 update

Item	High	Low	Avg	Chg	Chart
Thin Film Price (Per Watt)	0.70	0.50	0.617	– (0 %)	

## CPV

2014/03/12 update

Item	High	Low	Avg	Chg	Chart
CPV Price (Per Watt)	2.55	2.09	2.303	– (0 %)	

## PV Inverter

2014/03/12 update

Item	High	Low	Avg	Chg	Chart
PV Inverter Price (Per Watt)	0.25	0.11	0.187	– (0 %)	

# Some Pictures



# Thank you



## Questions ?