

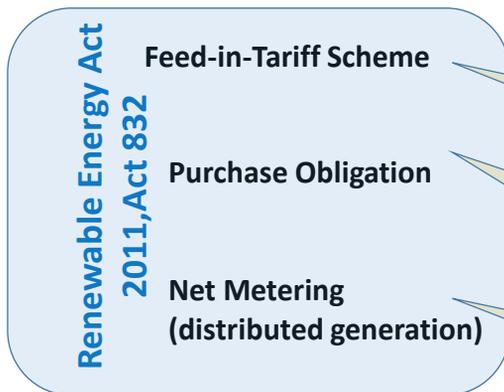
A Case Study of Solar Energy Applications in Ghana

The Case for Solar Energy Utilization in Ghana



Abundant Solar Irradiation across the country

Renewable Energy Policy Strategy



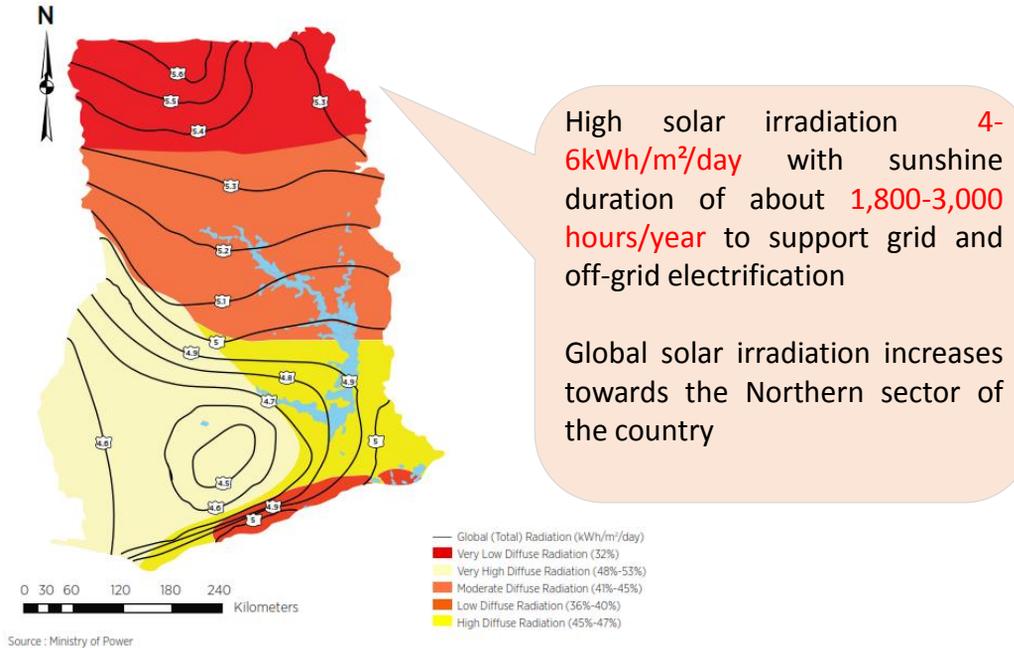
Increase the contribution of RE source (including hydro, solar, biomass and wind) by 10% for grid, mini grid and off-grid applications; by 2020.

Under which electricity generated from energy sources would be offered a guaranteed price

Distribution utilities and bulk electricity consumers would be obliged to purchase a certain percentage of their energy required from electricity generated from RE sources

Under which RE generate on site may be delivered to the local utility to offset the cost of electricity

Solar Energy Resource Potential in Ghana



Renewable Energy Applications in Ghana

Off-grid Solar Electrification

- Solar for off-grid application has potential to increase energy access for:
 - Limited lighting and battery charging
 - ICT (TV, radio, entertainment phone charging)
- Significant impact quality of life of rural people
- Mobile phone charging, music and other forms of entertainment are made possible with solar power.
- Solar has potential to support ICT education in remote rural schools



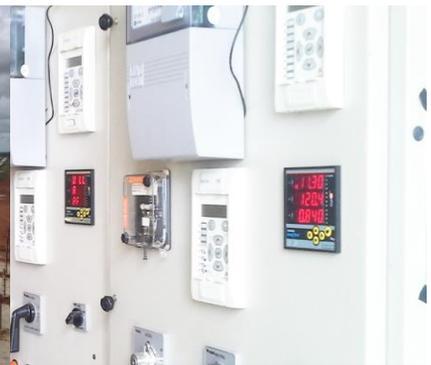
Improved Health Facilities – Solar Vaccine Refrigerators

- Community Health Planning and Service (CHP) centres equipped with solar vaccine fridges.
- Solar lights for the CHPs makes it possible to see patients at night
- Child delivery and other emergency health cases could be attended to at night.



20MW Solar PV Plant at Onyandze in Western region of Ghana

Built by BXC Ghana Company Ltd. (a subsidiary of Beijing Fuxing Xiao-Cheng Electronic Technology Stock Com Ltd.)



Volta River Authority's Grid-connected Solar Plant at Navrongo



- 2.5MW
- Commissioned on 9th of May, 2013.

- 3,622 Polycrystalline modules
- 11.79 acres
- Constructed by China Wind Power



Solar-biomass drier at the Ejura Market in the Ashanti region of Ghana

- Drier built by Pens Food Bank in collaboration with the Agricultural Engineering Department of the Kwame Nkrumah University of Science and Technology (KNUST) in Ghana.
- The drier can be used for drying 5mt of produce per batch (2 batches/day) over a period of 8 hours.
- It has a biomass furnace which uses 30 kilos of corn husk for drying harvests per batch during the major (raining) season.
- Biomass furnace pump and air circulation fans in the drier are powered by solar PVs.
- Cheap, efficient and reduces post harvest losses



Solar Street lights

- Community Solar (street) lights have reduced the risk of wild animal/reptiles (snakes) confrontation.
- Women take advantage of the Community solar light for economic activities.
- Solar streetlight and cameras at security outpost has enhance visibility of security officials.



Rural communities



Cities

Solar-wind hybrid micro-grid at Peditorkope, an island community in Ghana



- Peditorkope island is located in the Dangme East District of Ghana.
- The community with a population of about 1,500.
- Facility is an AC micro-grid hybrid system of 39 kW solar, 11 kW wind with a 30 kVA diesel back-up generator.
- The facility is to generate power for the community and to support economic activities on the island.



A similar facility has also been built for some surrounding islands to generate power for domestic and commercial purpose.

Improved Water Delivery – Nabogu Water Works

Solar water purification prevents drinking of contaminated water from rivers and streams.
This \$125,000 project provides clean water for 1000 inhabitants who rely a tributary of the White Volta for their water needs at Nabogu



Solar PV (5 kw) on the roof water purification system

Clearly the social and economic benefits of Solar PV far out ways the financial cost involved.

Solar irrigation

Solar Irrigation System at Tamalugu



15kW solar PV and 30kW pump for irrigation



- UNDP sponsored project implemented by NewEnergy
- 15kW DC pump with advanced communication and monitoring capabilities
- Pump is powered with a 30kW PV module
- PV array can be sized to match the pump to increase the pumping capacity
- Pumps 166,000 litres of water per hour from a tributary of the white volta
- Furrow irrigation – 28 acres, Drip irrigation – 3 acres
- Irrigation tariff – GHC100/acre for the whole season



SOLAR WATER HEATERS IN GHANA



Solar water heaters for steam generation for industrial use – HPW Fresh & Dry Limited, Ghana



Solar water heaters in some hotels in Ghana



Installed Solar Thermal Capacity in Ghana (m2 and kWth)

As at the end of July, 2015, the total installed capacity of solar water heating systems was estimated to be 1018.48kWth (1454.97 m2) - ECREEE

Solar PV System for Large Scale Irrigation

- Irrigation is usually done during the day time
- Adequate solar irradiation & sunshine hours across the country during day time
- Farmers seek alternative sources of energy which incurs less energy charges
- Renewable energy generators provide free energy

Case study of Solar PV for Irrigation

50 kw Solar PV system to power 38 kw pumps installed by a Private Chinese Company



50 kw PV array



50 hp pump

About 100 farmers rely on this facility for irrigation of paddy fields at Aveyime in the Volta region of Ghana

Case study of Solar PV Large Scale Irrigation

Akumadan Old Site



70 kw PV array

A 70 kW solar PV system has also been installed by the Chinese company to operate the abandoned old irrigation site at Akumadan.

This is by far the largest solar irrigation project in Ghana even though there a number of smaller units some of which have been supported by UNDP.



Maize plantation at Akumadan Old site

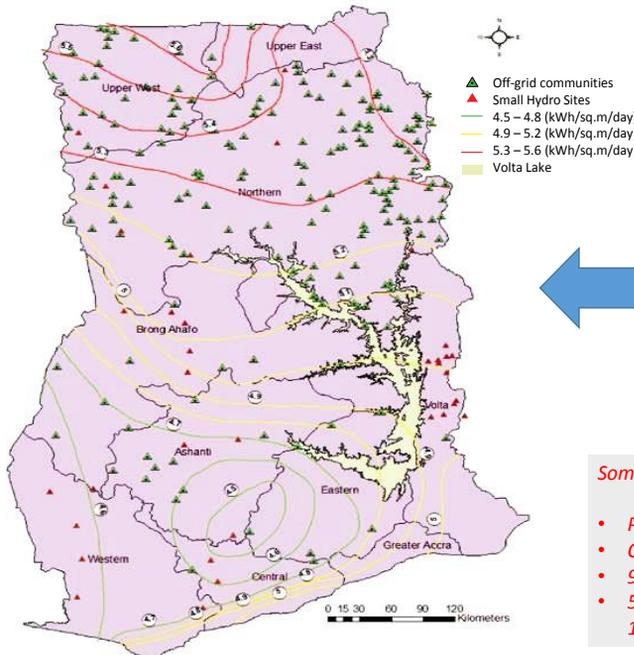
There is huge potential for solar irrigation for the schemes.

Power from the solar generator could be stored in the national grid during off-irrigation periods through the net metering system to off-set any cost of energy usage from the grid.

Specific issues to be addressed to make the project viable:

- A sustainable business model that offers affordable cost of energy to farmers and makes the investment worthwhile for private sector
- Establish a good energy accounting mechanism for energy supplied by the PV system
- Monitor the performance of irrigation powered by solar system

Map of Recommended Off-grid Communities in Ghana with Solar Radiation Levels



More opportunities for investment in solar energy applications

Most off-grid communities clustered around the northern belt with high solar irradiation

Some key facts regarding irrigation in Ghana:

- Potential irrigable area is 1.9 million hectares
- Only 210,000 hectares (11%) is under irrigation
- 95 % of the estimated area is under the private sector
- 56 Public irrigation schemes covering a total area of 11,000 hectares are in operation

THANK

YOU!

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