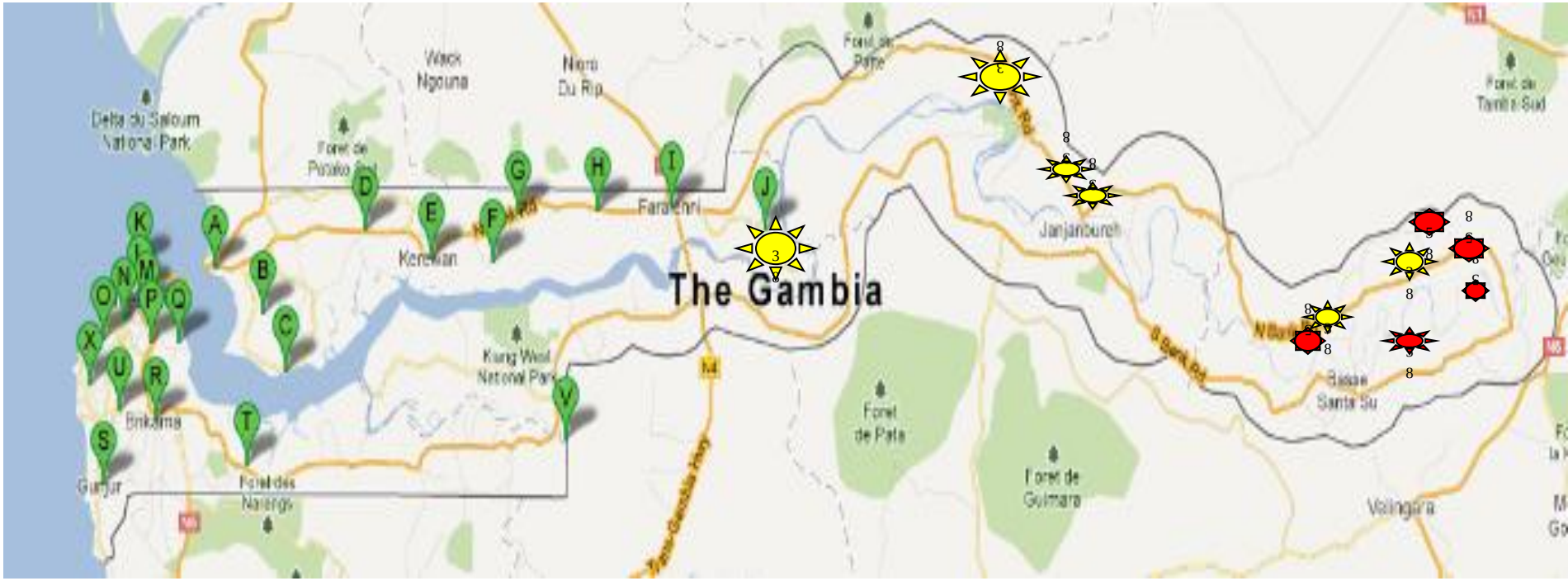
Sulayman Junkung Hospital and Power Up Gambia

- Working collaboratively since 2007 on solar power systems to “power up health”
- 12 kW solar power system with 3000 Amphr battery back up running at hospital since 2009
- Power Up Gambia – fundraising and project development/design (F/PD)
- Sulayman Junkung General Hospital – operations and maintenance (O&M),

Statement of Need

- Reliable Water Source – critical for sanitation, prevention of cross-infection, patient care
- Reliable Electricity – lights for night time emergencies and patient care, maintain vaccines and drugs at proper temperature, run laboratory diagnostic equipment, maintain emergency blood banks, keep accurate patient records, improve staff morale and retention

Map of Facilities with Need (draft v.1)



Stand Alone Systems

- Standardized Design – Stand Alone Solar Suitcases and Small Watt Systems

Major Flaw in Stand Alone Systems

- Batteries: most small clinic systems are failing within 2 to 3 years due to battery failure
- When purchasing high quality deep cycle batteries, battery costs make up almost 30% to 40% of the project costs
- Few health care projects can afford to replace batteries that frequently
- Concerns about recycling large numbers of lead acid batteries

Grid – tied PV Systems for Health Care in The Gambia

- Solution for Energy Storage issues
- Can provide Renewable Energy for the National Grid system while helping to address critical health care needs
- Net metering options allow “banking” of energy produced without need for cash payouts from either agency
- Grid tied Power Purchase Agreements could be possible revenue source for resource contrained hospital operations

PV Power System – Phase 1 – Stand Alone with Battery Backup

Sulayman Junkung General Hospital Solar Power System as of July 2011

15 Panels are racked on each Etatrack 1500 single axis trackers with controllers on each tracker. There are 6 trackers in all

Battery and charging shed. This cinder block shed is immediately adjacent the panels. It houses the battery bank, inverters, chargers, fuse and cluster boxes. It is well ventilated with several open but screened windows, with security grates on the doors and windows

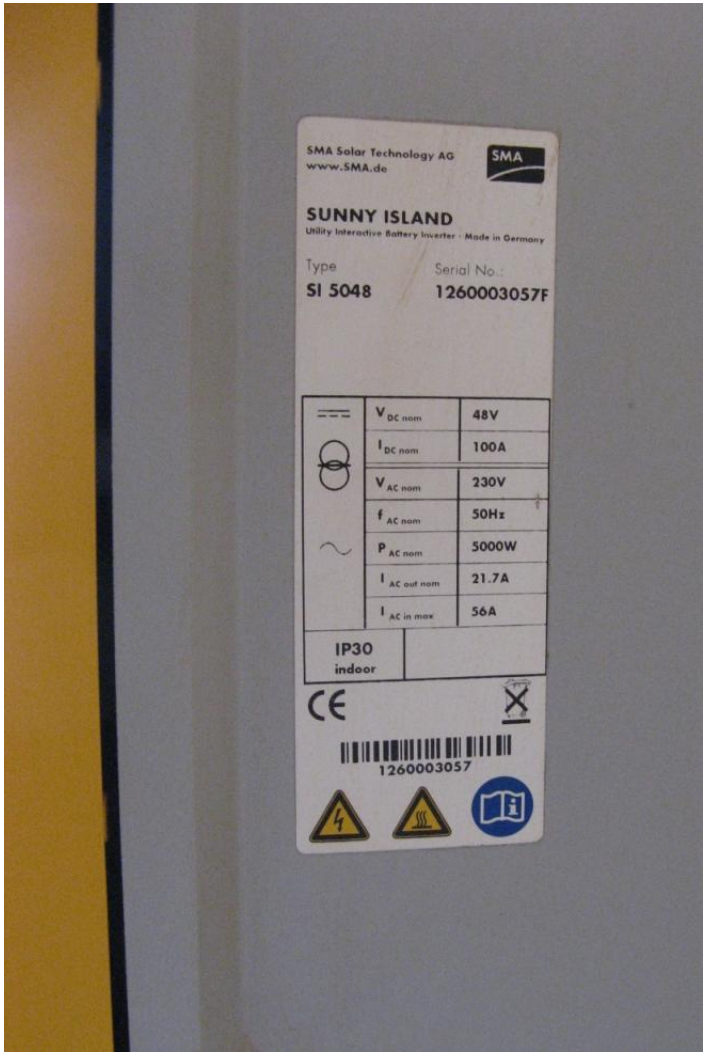
Currently we have no wiring diagram or line drawings to show how the connections are made through the cluster box.

During the day, the DC power from the panels runs to the Sunny Boy Inverters (red boxes) and is converted to AC. The majority of that AC power is then sent out to the hospital. Mid day, when the solar power produced exceeds the demand of the hospital, a portion of the AC power is sent to the batteries through the Sunny Island converters (yellow boxes).

At night, the batteries feed DC back through the Sunny Islands (yellow) to be converted to AC for the hospital.

Each tracker array goes to a separate Sunny Mini Central Inverter. There are 6 inverters mounted in the battery house, input from each tracker is nominally 1980 W

SMA Mini Central inverter 5000 WNom / 5500 WMax grid-tied operation, grid frequency 50 Hz / 60 Hz auto-detection, incl. Electronic Solar Switch (ESS).



Sunny Island

SMA Bidirectional battery inverter for island operation, output: 230 V AC / 50 Hz, battery voltage: 48 V DC, external battery temperature sensor, SD / MMC card, synchronisation cable.

Battery Bank –

Exide Technologies Solar Classic OPzS Flooded Lead Acid. There are 24 2V, 3100 Ah batteries connected in series for a 48 V system. They were installed at the hospital in the summer of 2009.

Corrosion on the battery post (inside the battery) was evident on two of the four batteries that failed

Phase II – Net Metered Connection and Doubling PV Capacity of the system at SJGH

- **The original design was suppose to allow for a doubling of the system size, from 12 kW to 24kw.**
- **There are two extra SMA Sunny Boys that have not been hooked up to the system yet.**
- **There is sufficient room in the shed for a doubling of the battery bank.**
- **The hospital has a bi-directional meter**

SJGH from GoogleEarth

GEF/UNIDO Proposal

Request:

- Include Significant Training Component
- Replicable Model
- Increase Impact Potential

Response:

- Include Significant Training Component by modular design built at training workshop
- Replicable Model at Health Clinics as well as at SJGH
- Banking scheme for electrical supply
- standardized design , standardized construction

Proposal

Why not look at more that just SJGH. If net metering can solve the battery issues at SJGH, why not look at net metering for clinics that also have access to the grid?

- Use a well engineered standardized design that receives pre-project approval from NAWEC
- Use the same equipment in each project that has been reviewed and approved for grid-compatibility by NAWEC
- Use bidirectional meters with bi-monthly reporting of each clinic's electrical usage to NAWEC, provided by Power Up Gambia
- Do annual joint site visits w NAWEC and PUG to review
- Use the standardized design as a teaching tool by doing construction workshops in partnership with GREC and GTTI to assemble the clinic PV systems in class, inspect and test, then disassemble and move to the clinics for final assembly and interconnection

Proposed timeframe

Jan	-	Receive Funding
	-	Project design and equipment approval
Feb		
	-	Finalize recipient clinic and negotiate
April		interconnection
	-	Select workshop instructor, obtain equipment
June	-	Advertise opportunity and select first class
Aug	-	Run workshop, construct 3 PV systems
	-	Select crew for installations
Sept	-	Install clinic projects
	-	Install SJGH project
Nov	-	Complete interconnections
	-	Final project review, and scheduling of second
Dec		workshop for 3 additional PV systems

Phase III for SJGH – Power Purchase Agreement

- Patient Load at SJGH has doubled in the 4 years since the solar power system was installed in 2009

- Hospital CEO Mr. Badgie reports in 2013 they have treated more patients than ever before
- Budget for the hospital has not increased to match the demand
- Heavy dependence at MOHSW on outside aid agencies creates uncertainty in future budgets, compromising patient care

Leveraging the large underutilized hospital grounds to produce renewable energy for sale to the national grid has the potential to transform health care in The Gambia

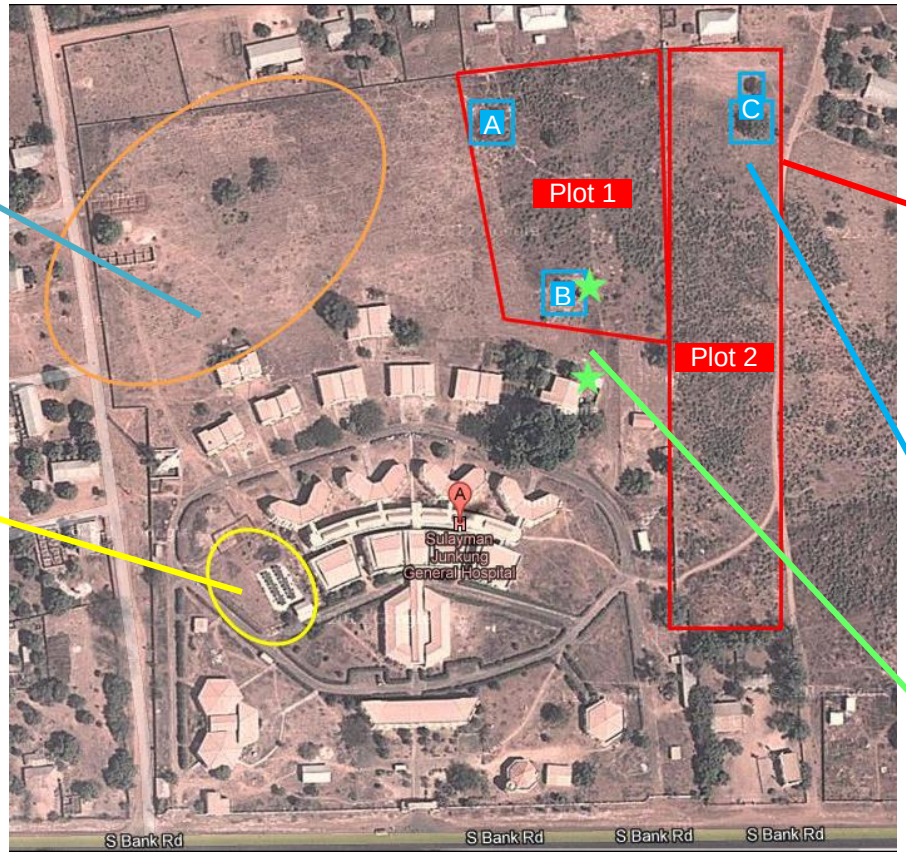
The available land at SJGH is estimated[1] to be able to support a ~1 MW solar installation with a grid connection in close proximity

SJGH Land Layout and Availability Overview

PRELIMINARY[1]

Hospital land for other uses including patient farm, additional residences, and recreational areas

Current solar installation (~12 kW); 'Phase 2' assessment from GamSolar confirmed this is enough space for at least another 6 trackers (~12 kW), which would double the capacity and supply 100%+ of electricity demand at the hospital



'Phase 3' land options: total of ~6.1 acres (excluding identified obstructions) to support ~1 MW solar installation[1]. Plot 1 = ~2.8 acres and Plot 2 = ~3.3 acres

There are 4 identified obstructions in these two plots: A) Bilboa tree, B) water tanks and supporting solar system, C) two large trees

Existing NAWEC grid connection points (2)

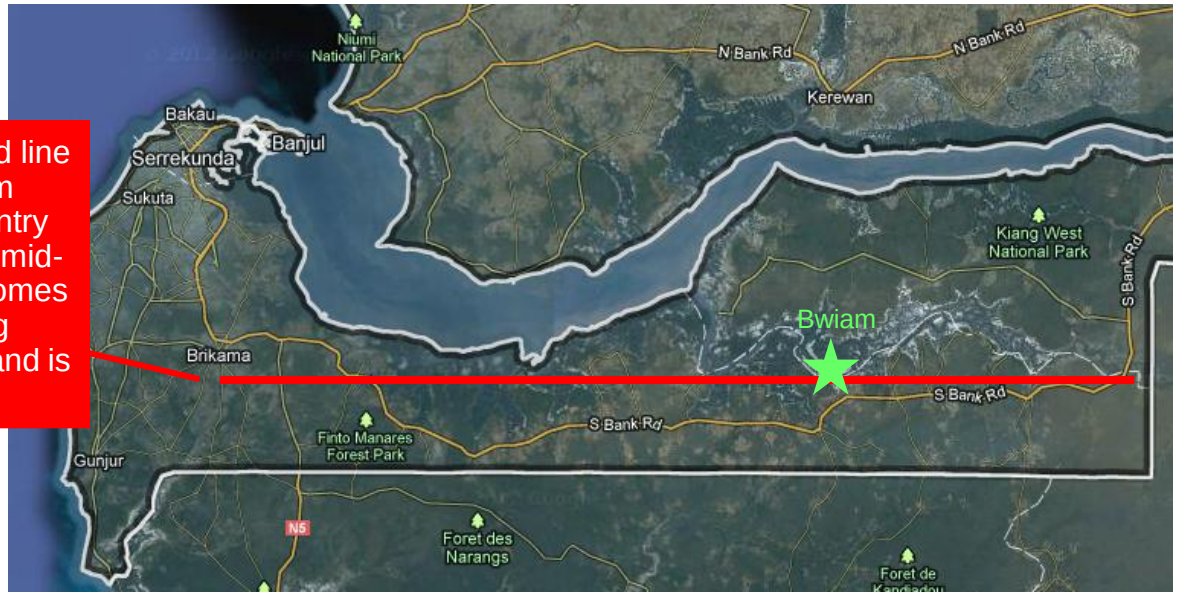
1. Solar installation calculation assumes that 5-6 acres of land can support ~1 MW system; these estimates are preliminary and must be confirmed by a solar expert through a detailed proposal on the exact layout and specifications of the system

Source: Map from Google Maps, estimates completed by the team

1 MW solar system in Bwiam could supply ~50% of total regional demand, covering SJGH's catchment area![1]

Potential Impact of the Proposed Solar Expansion at SJGH

New NAWEC grid line that runs from Brikama to country border went live mid-2012 although homes are still being connected; demand is ~2 MW



- Current demand on the NAWEC grid line that runs from Brikama is ~2 MW; hence an IPP system that supplies ~1 MW could meet ~50% of current demand in this area
- The expanded SJGH system could supply the hospital's catchment area with electricity, in addition to continuously improving health care
- Assuming that the solar power NAWEC could buy from SJGH in the future is less expensive than fossil-fuel based generation, this project could also improve overall power economics for the country

1. This estimate is based on input from NAWEC and PURA
Source: Map from Google Maps; other insights from NAWEC and PURA during meetings that occurred in December 2012

- Power Up Gambia in collaboration with Sulayman Junkung General Hospital has initiated discussions on this project with MOHSW, NAWEC, MOE and PURA

- PUG and SJGH have begun discussions with potential funders for demonstration and project development funds

- PUG board Members Brent Beerley and Kelsey Christian are leading the project team. PUG has formed an Advisory Committee of PV industry members to review and advise on the project

Unexpected problem: Project is “too small” for many RE funding agencies

Project Need:

- Investors and funders who understand the value of a steady progressive roll-out of the project

- better understanding of expected costs for financial model

- signed PPA with set feed-in tariff to allow finalization of the financial model for funding