



Renewable Energy Against Covid19

1st Case Study: 10 kWp PV Plant for DREAM- Health Care Center of Nchiru (Meru - Kenya) AINA Onlus – Sant’Egidio



Preliminary Activities and Expressions of Interest

This is a Call to Action to gather a sufficient number of organizations, interested in building solar energy plants in developing countries institutions that are fighting Covid.

The document analyzes optimal configurations to implement solar mini-grids for Health Centers in Africa, with the purpose of fighting Covid-19.

Considering the actual emergency, **DREAM** (Disease Relief through Excellent and Advanced Means) Centers of Sant' Egidio NGO expressed their interest in implementing solar energy plants, and they have been selected as first cases, due to their high-level reputation and former results on HIV contrast.

Technical Solidarity and *Sapienza University*, within *US NAE-Grand Challenges Scholars Program*, started pre-screening activities on the 4th of April, studying analogue situations in East Africa, and decided to start with the DREAM Center of Nchiru, located in Meru County (Kenya), where they stayed in January 2020 (quest'ultima frase "where they stayed in January 2020 non la capisco bene, io la toglierei proprio).

Micro Grid Academy of *RES4Africa*, *Électriciens Sans Frontières*, and *Alliance for Rural Electrification (ARE)* are sharing their efforts respectively on didactic, engineering and fundraising aspects to support the initiative to electrify **the Sant' Egidio health care center** in Kenya.

Each organization with its own competences in **trainings** (*Technical Solidarity* and *Micro Grid Academy*) **engineering** (*Electricists without Borders*), sharing **procurement and fundraising** parts with *Sant'Egidio* and *Aina*.

Context: Covid in Kenya

The Covid-19 pandemic has rapidly affected most of the world and many African Countries are facing this emergency. According to a World Health Organization situation report of 24th April 2020, 1305 cases and 26 deaths have been recorded in the African region so far, in 37 countries. In Kenya the current situation is shown in the graphics below:

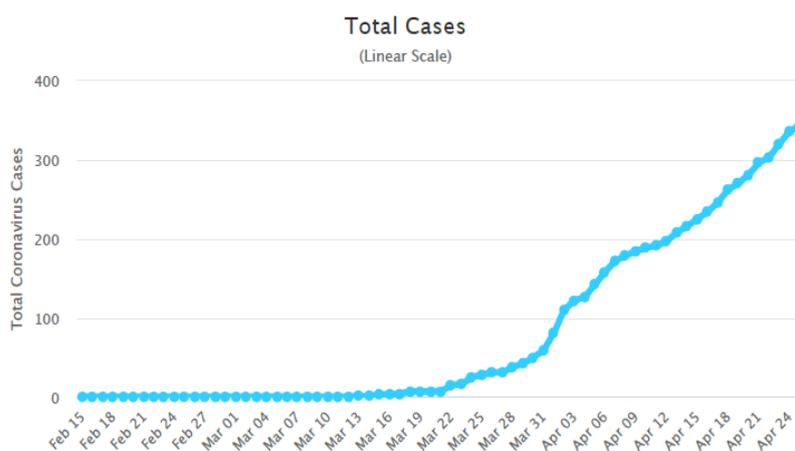


Figure 1: Total cases in Kenya from worldometers.info

This situation caused great concern both among governments and population. Many governments, following the European lead, have already applied measures of social distancing and, in some cases, lockdown, besides closing borders.

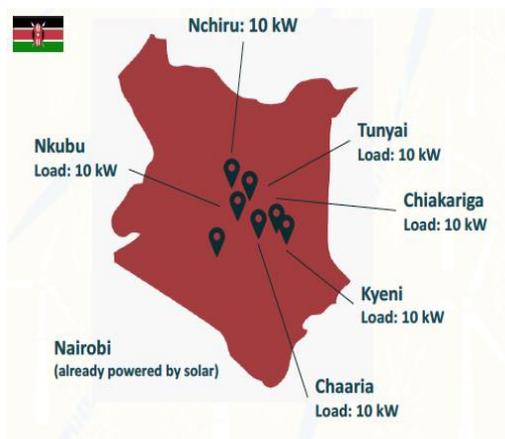
COVID 19 disease represents a double challenge in Africa, where people tend to live in overcrowded homes, with few toilets, lacking availability of water, and where an extremely mobile population is served by often overcrowded public transport..

Hygiene and social distancing measures will, therefore, be difficult to apply. In addition, healthcare facilities are already overloaded in many countries, and life support machines are unavailable. Both virus and panic have spread among the population, causing shortage of masks and sanitizing gel, and the circulation of fake news about the causes of infection.

Observing our first case study, we evaluated to upgrade at 10 kWp the existing energy system, allowing these centers to install more technologies for the health care system, such as telecommunication servers.

S.Egidio DREAM Projects

Our focus is given to DREAM, **Disease Relief through Excellent and Advanced Means**, a project carried out by **St. Egidio Community** in Africa. The project aims to foster solutions for health fighting HIV and malnutrition.



In the framework of COVID-19, the DREAM center could play an essential role in prevention, diagnostic and treatment. In Kenya DREAM operates in 7 centers, distributed in the middle of the country.

Due to the lack of a reliable national grid, most of the DREAM centers rely on diesel generators for energy supply, facing high costs and logistical issues for fuel supply. Moreover, due to the lockdown caused by COVID-19, shortages of fuel are even more frequent,

hindering the regular operation of the centers. This document will focus on the **DREAM Health Centers in Nchiru, County of Meru.**

Technical Solidarity, Sapienza and Micro Gri Academy links to Meru

In January 2020, during the **XVI Grand Challenges - Field Study Abroad**, led by **Sapienza University and Technical Solidarity**, two missions in Meru took place.

It means that under the Grand Challenges Scholars Program of the **National Academy of Engineering**, 15 Students visited and studied the northern part of Kenya, from Nairobi to Meru, Isiolo and Laisamis, and are already engaged to work on the project.

In the last 5 years, Sapienza and TS have been working for a Mini Hydro Plant Project in Meru County, and excellent relationships are established with the local government and population.

Another important link to Meru was established by the good number of 400 technicians who attended the **Micro Grid Academy** of **RES4Africa**, Foundation with *Sapienza* and *Électriciens Sans Frontières Italie* as associates and partners.

The most involved organization is AINA, based in the Nchiru Dream Center (Meru).

DREAM Health Center of Nchiru is in Meru County, 300 kilometers far from Nairobi. The structure was built by AINA ONLUS in a village where more than one hundred HIV-positive children live.

This village's structures are a primary school, a health care service for children, a vegetable field ("Shamba" in Swahili) and the accommodation for all the children in the village and the staff as well.



The DREAM center is placed (is placed non capisco cosa voglia dire), provides health care not only to the people living in the village, but also to those from surrounding areas. The dispensary is equipped with machine laboratory for biomolecular analysis, refrigerator for medicinal storage, and computer for telemedicine purposes.

A photovoltaic system has recently been installed in order to provide electricity, in consideration of the large (forse piú che large, regular?) annual solar radiation in the area.



Figure 4: Aina Village's view on the map - Aina village's satellite view



Figure 5: Aina village's view

The Photovoltaic System

The village is connected to the national grid, which provides the electricity needs of the different facilities (detto così però, sembra che abbiano tranquillamente elettricità a disposizione grazie alla rete nazionale. Io metterei un punto dopo "national grid" e cancellerei tutto fino a "Besides" Besides, a diesel generator is present for emergency electric outages.

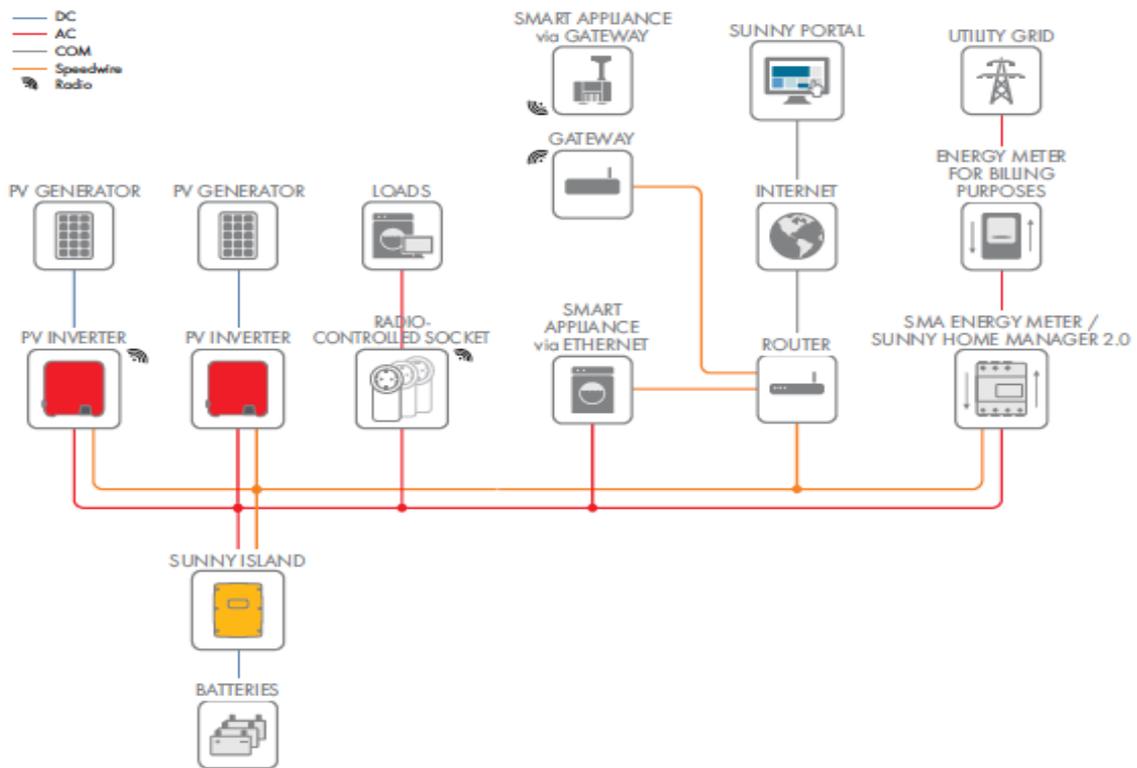
In this section the energy system will be analyzed carefully. The starting point will be the monthly consumption of the village, estimated between 2900 kWh and 3500 kWh, which is reflected in considerable sums spent on *electricity bills*.

Recently, a small photovoltaic system has been installed to provide electricity to the dispensary.

Technical specifications are shown in table 1.

Photovoltaic Modules	5.3 kWp
Nominal battery capacity	7.968 kWh
Battery type	VRLA
Inverter	Sunny Boy 5000TL-21

Table 1: Technical specification (Sunny island 6.0 H)



In fig.9, shows an example of a photovoltaic system these components, where a user portal is present for monitoring the system. Technical Solidarity and Sapienza have been authorized by AINA charity to access this information in order to analyze and monitor the production of the PV systems and consumption of the related utilities.

This section shows the analysis of an average day , explicating how the system works.

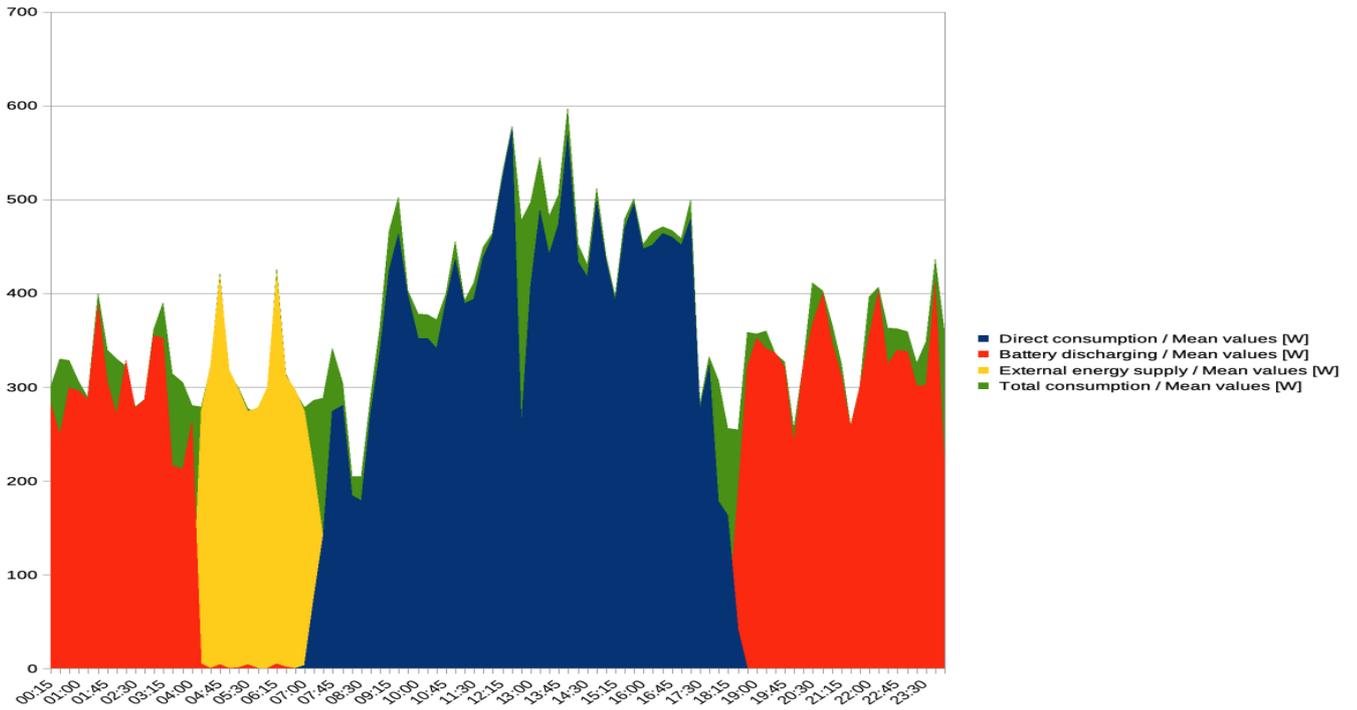


Figure 2: shows the production of the photovoltaic system during the day. The green area represents the systems production (mean value in W) in different hours. Part of the generated energy is directly consumed by the dispensary. The supplementary energy

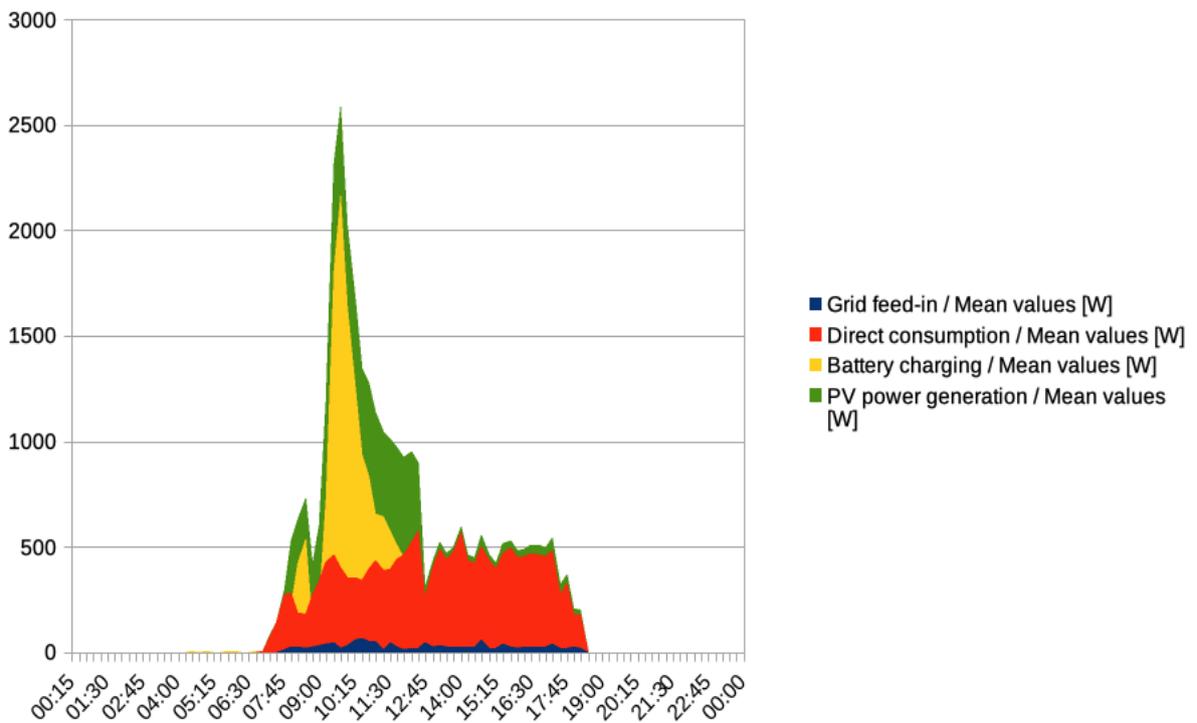


Figure 3: Dispensary consumption

We can observe the dispensary consumption in fig.11. The actual consumption of the dispensary is represented in green, and is divided in direct consumption (blue) from the photovoltaic system, 'battery discharging (red) during the dark hours, and energy supplied by the grid, when the batteries are discharged (yellow area).

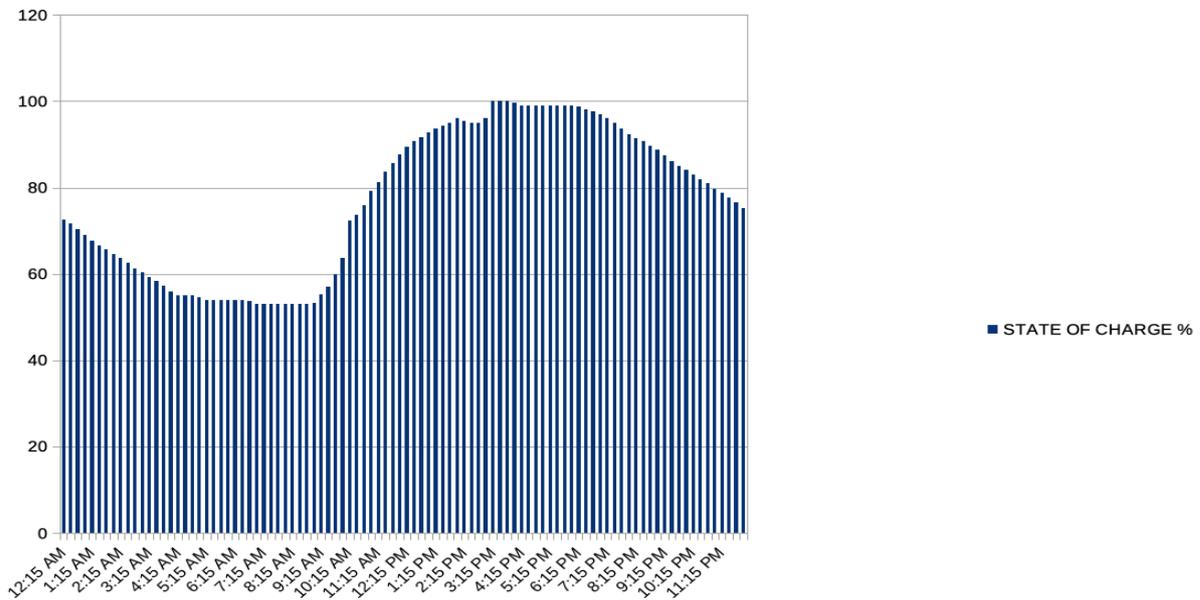


Figure 4: Dispensary consumption

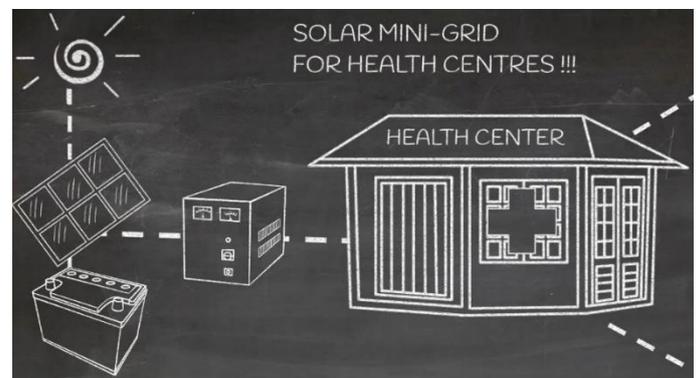
Finally, it is possible to observe how the battery system charge and discharge (in percentage) during the hours of a day from figure 12.

System Upgrade

In this section, we will analyze the necessary arrangements and interventions for an **extension of the photovoltaic system**.

Considering the actual emergency of Coronavirus in Africa, DREAM centers should be enhanced for allowing the installation of new technologies, enhancing their capacity in fighting the pandemic Covid-19.

Observing our first case study, we evaluate the **necessity to install 10 kW**, in addition to the existing system, allowing the centers to install more health care system technologies, such as telecommunication servers.



The necessary **budget** for this first plant will be around **30.000 USD**.