



Implementing Renewable Energy Generation for a College in Kenya

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Introduction

This project focuses on investigating the implementation of renewable energy generation for a college in Kericho, Kenya. The name of the college is Nishkam Saint Puran Singh Institute (NSPSI).

The idea of this project came about when the author visited the Kenya in 2018 and discussed the energy issues at the time with the principal and the site manager.

The college is connected to the local grid, which is not very stable and cuts out quite often and does not currently have access to its own backup generator for when the power cuts out.



Photograph of Nishkam Saint Puran Singh Institute (NSPSI)

Project Aims

This project aims to:
Research and implement the most viable renewable energy generation solution with the use of an energy audit of the college and weather data for Kericho.

Provide a uninterrupted energy supply to the college to minimise disruption to learning.

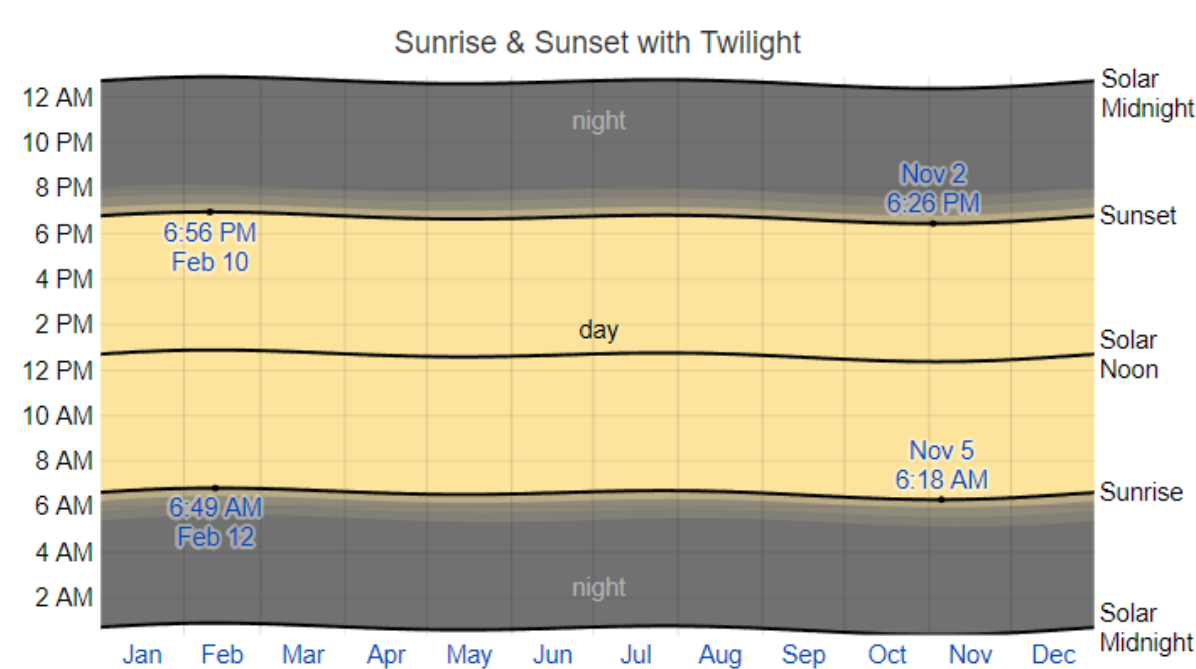
Methodology

Firstly the potential sources of renewable energy were investigated; hydropower, solar power, wind power, geothermal power, and biomass. Due to the size of the project geothermal power and hydropower were ruled out, and biomass was avoided due to there not being any viable sources locally.

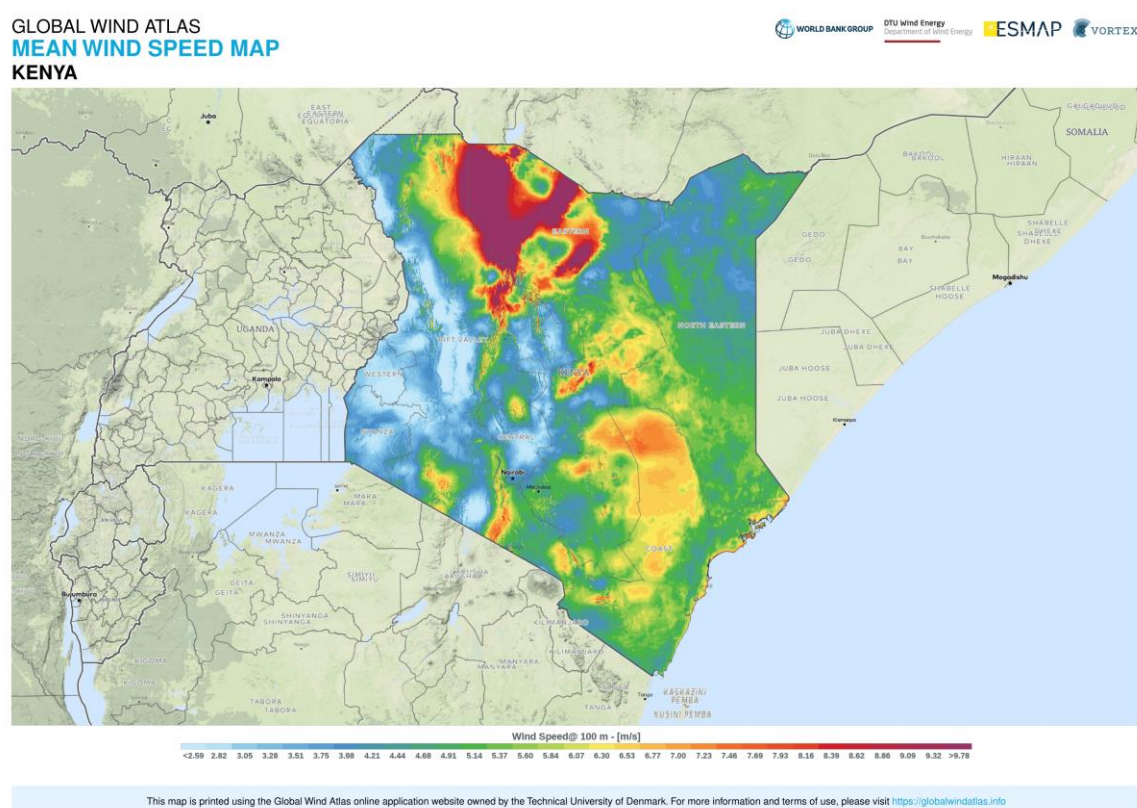
Weather data was then assessed, revealing that solar power was the most viable option. Due to there being slow wind speeds.

An energy audit was then undertaken to calculate the current energy usage of the college. The yearly usage came out to 22.6 MWh.

Finally, calculations were made to find the most appropriate setup of solar panels and batteries.



Average sunrise and sunset hours in Kericho (Climate-Data.org, 2018) [1]



Wind speed contour data of Kenya (Global Wind Atlas, 2017) [2]

Results

It was calculated that based on current energy usage of the college, 60 280-watt solar polycrystalline silicon solar panels would be required and 14 10.2 kWh batteries were required to be self-sufficient.

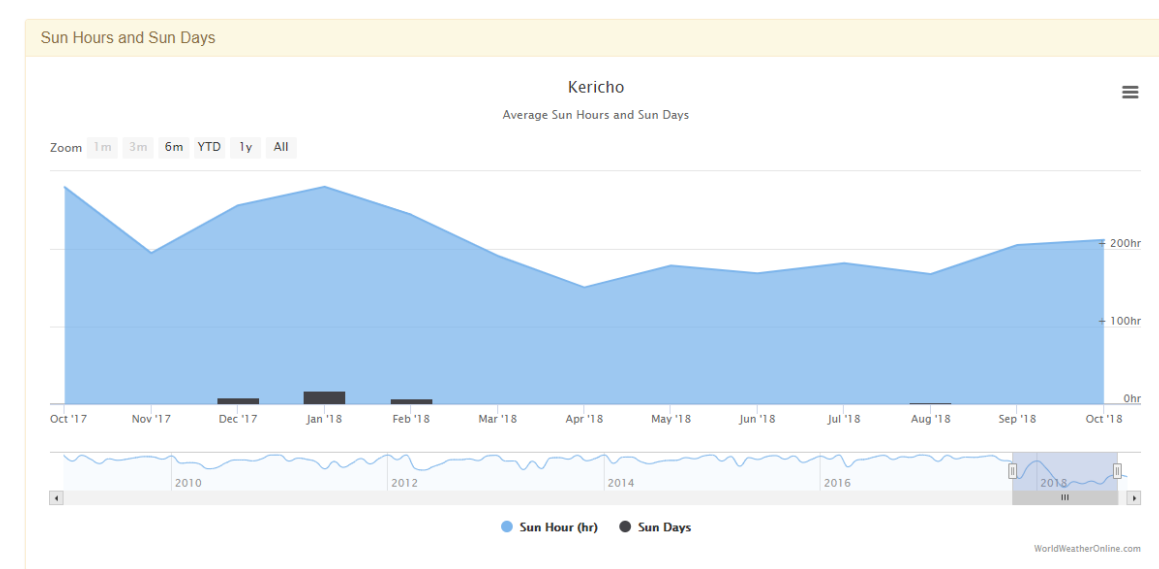
Racking up a total cost of £92,400, with the batteries being the most expensive part of the system.

Table showing a breakdown of the energy audit

Appliance	Qty	Capacity /w	Duration in use (per day) /hrs	Energy Consumption per day /kWh	Notes
Lights	255	32	8	75.52	30 rooms + 2 lecture halls
Computers	30	170	6	30.6	
Router	5	10	24	1.2	
Fridge	2	150	7.2	2.16	On 24 hrs but fridges only run 30% of the time
Kettle	2	3000	0.5	3	
Printer	5	800	0.16	0.64	On 24 hrs but on standby, in use 10 mins
Total kWh per day				113.12	
MWh per year				22.624	5 day a week, 40 weeks a year

Appliance	Qty	Capacity /w	Duration in use (per year) /hrs	Energy Consumption per year /MWh	Notes
Air con	28	3500	540	52.92	3 hours a day for 6 months

Total Energy usage per year including Air con.	75.544
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Average sun-hours each month in Kericho (World Weather Online, 2018) [3]

Conclusions

The aim of this project was to research on and how to implement renewable energy generation for a college in Kericho, Kenya. This was to overcome the current problem of an unstable grid connection leading multiple power cuts a day causing a disruption to teaching and learning, whilst also providing a more environmentally friendly solution for a faith-based organisation.

Batteries are currently the most expensive part of a renewable energy project. Further research can be done into finding or even developing a cheaper yet efficient battery for use with renewable energy generation.

References

[1] Climate-Data.org, 2018. Climate-Data.org. [Online]

Available at: <https://en.climate-data.org/africa/kenya/kericho/kericho-921/#climate-table>

[2] Global Wind Atlas, 2017. Global Wind Atlas. [Online]

Available at: <https://globalwindatlas.info/>

[3] World Weather Online, 2018. World Weather Online. [Online]

Available at: <https://www.worldweatheronline.com/kericho-weather-averages/rift-valley/ke.aspx>