Case Study

Solar and wind energy system

Khayelitsha District Hospital (South Africa)

GGHH Agenda Goals

- Energy

Hospital Goals

- Saving energy consumption by using solar energy and wind turbine energy to reduce carbon footprint and costs.

Progress Achieved

- Khayelitsha hospital makes use of a solar and wind grid-connection power plant that is connected to the electrical system and was commissioned on 30 August 2011.
- The aim is to reduce energy consumption and carbon emissions
- As from 30 August 2011 to 14 January 2014 the solar and wind plants have generated 138198 kWh of electricity. This equates to 137 tons of carbon emissions having been avoided. This corresponds to the CO2 emissions of a car traveling a distance of 1 053 393 km.
- Furthermore, the hospital staff has been brought on board to switch of all unnecessary electrical appliances and air conditioners. The saving of the solar and wind plant, together with the awareness of switching of electrical appliances has resulted in a financial saving of about R200 000.00 per month.

The Issue

Khayelitsha District Hospital is the first hospital in the provincial government western cape that is equipped with a green initiative such as solar photovoltaic system and a wind energy system.

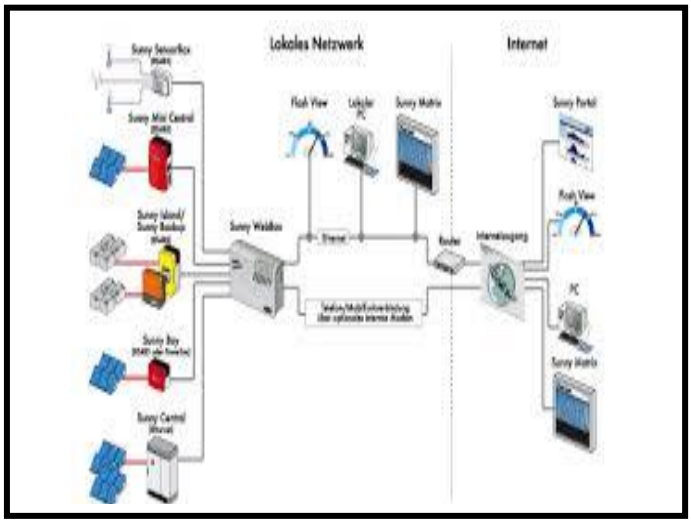
Sustainability Strategy Implemented

Currently South Africa experience frequent load shedding due to major maintenance problems at our power plants. By installing the 25 kWp solar system consisting of 108 solar panels on the roof of the hospital, and two wind turbines each with a capacity of 2 kW wind energy, the hospital managed to reduce electricity use.

Implementation process

The Photovoltaic and wind system has been installed by Power Solutions (www.powersolutions.co.za). Their Senior Engineers are registered as Professional Engineers with the Engineering Council of South Africa. They are also members of South African Institute of Electrical Engineers; South African Photovoltaic Industry Association; Green Building Council of South Africa and the South African Alternative Energy Association. This system generates DC voltage up to 900 V and AC voltages of 400V.

The 108 **solar panels** stretched over an area of 190m² It generates electricity during sunshine hours and feeds into the electricity grid. At night it goes into standby mode. This system does not export power into the municipality grid therefore Khayelitsha hospital is a net electricity importer. The power generated is about 25 kW at noon on a clear day and that generated energy of approximately 40 MWh per year. The warranty on this system is a life expectancy of 25 to 30 years still providing 80% of the current output.



The wind energy system consists of two vertical axis wind turbines (VAWT) with a safety brake switch, windy protection box, Diversion load and WindyBoy grid inverter. The WindyBoy inverter converts the power generated by the VAWT to make it compatible to the electricity grid. The voltage first need to be rectified by the Windy Protection Box. The safety brake is used to stop the system when the wind blows extremely strong (in excess of 40m/s)

This system is monitored by the sunny WebBox, which logs all the data of the system and sends it via the local network to an online portal. In this case Power Solutions monitors all the data.

Tracking Progress

The system was also installed with a sunny webbox. This webbox is a system monitoring, remote diagnostics, data storage and visualization and serves as the communication centre for the solar power station. It gathers information form the system's side and allows the hospital to be continuously informed of the status at any given time. This system has a GSM modem and therefore don't need DSL or telephone connection to communicate from the remote location. It further has a large scale display unit in the main foyer of the hospital for everyone to see. This displays the total amount of energy generated to date; the current power output and total amount of carbon emissions avoided.

Challenges and lessons learned

Having a state of the art hospital comes with challenges, especially towards energy. Basically everything that is installed in the hospital is designed to ensure that patients and staff have enough fresh air that circulates in the areas, however, in order to maintain the desired air changes per minute, an air-conditioning system needs to be installed. Running this air conditioning system requires electricity. In other words, it is all very nice equipment, but in plain terms it would have been just as effective to rely on the wind and open windows for the sufficient air changes instead of an electrical driven air conditioning system that requires full time maintenance and electricity that is high in cost. Same applies to the fancy electrical turn style entrances. It takes unnecessary energy and therefore it is switch off to save on electricity and the public uses the manual entrances that remains open 24/7. Architects sometimes concentrate so much on the design and the building presents itself to the public, that they tend to forget that more simple systems would also have worked, will require less maintenance and will be more economic, especially with government building where supply chain processes have unnecessary red tape.

Demographic information

Dr Anwar Kharwa is CEO of Khayelitsha District Hospital (KDH). This is a Secondary Care hospital with a bed capacity of 300 beds, which was recently upgraded from 270 to 300. KDH renders a level 1 plus services, which means that the hospital renders a basic level of care for uncomplicated cases such as surgical, Obstetrics, Outpatients, Allied Health. However, the hospital does render a level 2 service for internal medicine. Secondary Care also means that patients have to be referred from other clinics to KDH to be treated at KDH and the hospital renders a support to 3 clinics within the Khayelitsha/ Eastern Substructure namely Khayelitsha Site B-, Michael Maphongwana- and Nolungile Clinics. The population in Khayelitsha is approximately 400 000. The hospital building has a floor area of 22,712 sq. m build on 11.95 Hectares. It has a trauma unit, theatres, Maternity ward, Antenatal ward, and post-natal ward, male and female medical and surgical wards, Outpatient - and Allied health department. It also has a small enclosed male and female psychiatric unit for 72 hour observations that is situated within the surgical wards. KDH has an approved staff establishment of 607 posts of which 567 post are filled. 3.7% posts are vacant and in the process of being filled.

Links

You tube clip- *www.youtube.com/watch?v=a9tmAhIyrRo*