Currently, the University's energy demand is 8 MWA, and it's strategic vision is to introduce additional electric power supply options (renewable) to supply up to 40% of its current power needs. The University is interested in green and clean options that are affordable, reliable and will contribute to sustained safety on its campuses. This vision is aligned to the Government of Ghana's agenda to promote the inclusion of renewable energy in the power delivery system. It also supports Sustainable Development Goal 7 which seeks to increase access to affordable and clean energy generated by renewable sources. The University of Ghana is the first Public University in Ghana with this strategic agenda to drive down its energy costs.

Towards the attainment of this vision, the Independent Power Supply Team has adopted an energy mix approach including the management of demand side activities. The Electricity Company of Ghana Ltd has been maintained as the primary supplier and alternative sources including 2MW solar and 100kW biogas are augmenting their supply. While this approach has contributed to addressing challenges of wastage and safety it has also positively impacted on the University and its surrounding communities.

In 2019/2020 academic year, the University recorded violent attacks in areas of the campus that were poorly lit. In response to these incidents' measures were undertaken in collaboration with the Ministry of Energy, Electricity Company of Ghana and Virtual Security Africa to make the Legon campus brighter and safer. This was done through the provision of energy efficient streetlights and the installation of solar backed security cameras at vantage points. Through brightening up the Campus, the University is contributing to the growth of a healthy nation by providing a safe space for people to walk, cycle and undertake healthy outdoor activities.

SUMMARY OF ACHIEVEMENTS

1. Solar Projects:

The intent of this project is to increase the University's utilization of renewable sources for energy generation. It is also intended to increase savings on energy and reduce its utility bills through the provision of reliable energy that ensures some energy independence.

a. The 715 kW (0.7 MW) solar farm at Noguchi Memorial Institute of Medical Research (NMIMR) was installed to provide clean electricity to the NMIMR. The system is designed such that excess electricity generated during the day is pumped into the University of Ghana. The Independent Power team has measured the excess power (kilowatt-hour) from January 2020 to August 2020 using a bulk metre installed at NMIMR. The total amount generated and pumped to the University is 49,712 Ghc (62,521 kilowatt-hour)

b. Installation and commissioning of a solar backed CCTV Surveillance System at the University of Ghana.

On December 3, 2019, the Vice Chancellor commissioned a surveillance center set up and installed by Virtual Security Africa (VSA)/ Aventura as part of its corporate social responsibility initiative. The Center was set up with technical support from the University of Ghana Computing Systems and the Electricals Unit of the Physical Development and Municipal Services Directorate. The estimated cost of the center is GHS 387,770.00.

This center will host a high-performance surveillance service with 24 / 7 / 365 availability and will enable the university to build upon it as it extends the coverage of the electronic surveillance to all other parts of the university. This would contribute

towards the University's efforts to fight crimes and also to ensure safer environment for students and the University Community.

c. The University has successfully shortlisted 16 companies to submit proposals to supply 2 MW of solar energy to augment the current supply. It has also engaged key stakeholders necessary for the success of the project. This includes the Ministry of Education, Ministry of Energy, Electricity Company of Ghana and the Ministry of Finance. As per national requirements the proposal documents are awaiting approval from the Ministry of Finance to proceed to the next stage of the procurement process.

2. Demand Side Management Initiatives:

The intent of this project is to reduce excessive energy consumption by the University Community through the adoption of measures that would facilitate energy savings to the maximum.

a. Race to Retrofits and Renewables Programme

University of Ghana is one of the biggest beneficiaries of the Compact Programme with respect to the Race to Retrofits Programme and also from the Primary Substation and Inter-Connecting Circuits & Commercial Projects, implemented through the Millennium Challenge Corporation (MCC)

Specifically, 500 energy saving lamps, 93 air conditioners and 70 ceiling fans had been installed as well as the supply of 15 low-energy refrigerators in the following areas:

· The Great Hall

· Registry- The Vice Chancellor's Wing

· Registry – Academic Affairs Unit

· The University of Ghana Computing Systems (UGCS)

It is evident that the project is making an impact based on an analysis of the real time consumption of energy in comparison with previous consumption prior to the installation of the energy-efficient appliances. Using this monitoring system, the University Management has been able to observe and track units to ensure optimum utilization of energy resources.

b. In partnership with the Ministry of Energy, the University of Ghana Replaced 250 Watts HPS with 150 Watts LED Street Lights

The intent of this project is to replace street lights with LED lamps to minimize the consumption of energy and increase the life span of lamps.

The refurbishment of streetlights along major streets of the University of Ghana has been completed in May 2019, by the Electricity Company of Ghana (ECG), through Prefos Ghana Limited. This has increased on campus lightening as well as enhanced the security and safety in major areas of the University's campus. The highlights of works included:

· Supply and installation of 1000 no. 150 LED luminaires to replace damaged or faulty HPS

· Supply and installation of about 800m and 1,000 m of damaged 4x25sqmm and 2x25 sq mm LV Cu cables respectively.

· Supply and installation of about 34No.and 2 No. damaged pole chamber cut outs and control cubicles respectively.

c. As part of efforts to enhance security at the University of Ghana Medical Center, the following energy efficiency devices were installed over the period:

· 78 electricity poles

· 78 LED streetlights and electric cables.

3. Biogas Project

The intent of this project is to support the University's vision of promoting a sustainable green environment and mitigate climate change while reducing the cost of its energy bills.

The University of Ghana has had four biogas plants for the past 10 years, however, they had remained dormant.

In March 2020 Beta Engineering Construction was contracted to recondition the biogas system at Dr. Hilla Limann. Currently, a significant amount of the desludging has been completed. The de-sulfurizer has been refurbished. After re-conditioning, the plant biogas and harvesting would be re-optimized, and the replaced pumps would function better. Additionally, the effluent filter would perform as designed and the gas would be measured regularly by the contractor to ascertain its viability for cooking.

The expected outcomes are quantified below:

An average adult excretion can generate roughly 0.03 m3 (30 litres) of biogas per day, therefore working with a population of 2000 people the expected biogas yield is up to 60m3 per day if they all evacuate using the water closets.

Calculating Financial Benefits of the Biogas:

2.1 m3 of biogas = Ghc 4.93

Generation of biogas per plant is equivalent to:

Daily: 60/2.1*4.93 = Ghc 141

Monthly: Ghc 141 * 30 = Ghc 4225.7

Yearly: Ghc 4225.7 * 12 = 50,708 (This is for one biogas plant)

Therefore, the yearly benefit of biogas production for the four (4) plants = Ghc 202, 834.

Other benefits include the recycling of the treated water for irrigation of the grass areas, once the effluent filter is regenerated and functional, so there are no objectionable odours. This is a huge cost saving as it replaces the use of potable water for irrigation.

The expected lifespan of biogas plant is 50 years with good maintenance. Gas holders last for 10 years before replacement when constantly used. This should last longer for the four hostels since they have not been constantly used in the past 11 years.

HIGHLIGHTS OF THE RESULTS

· The projects have provided practical opportunities for faculty and students to have hands on experience and carry out research at the NMIMR Solar facility as well as the biogas plant.

· In addition, the Independent Power Supply team has brought about significant enhancements in lighting on campus, managed energy consumption, and enhancement in security coverage through the installation of CCTV cameras.

· The University is contributing towards the attainment of the Sustainable Development Goals 7 by making clean and renewable energy accessible to its community.

· The University is aligning its activities to the vision for the energy sector in Ghana through adopting renewable energy as a source of energy supply.

· The digested sludge from the biogas plant which have dried can be used as fertilizer or soil conditioner at the agricultural farms or gardens on the campus. This is organic fertilizer.