

KUMASI TECHNICAL UNIVERSITY



POLICY ON SDG 7: SUSTAINABLE ENERGY AND ENERGY EFFICIENCY

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BACKGROUND AND PURPOSE OF THE POLICY

The mission of the Kumasi Technical University is to promote quality teaching, learning and research in engineering, science, technology and entrepreneurship to promote industrial development in Ghana. In this regard, the University continues to invest in building research capacity and culture in partnership with other universities, research centres, industries, businesses, professional bodies and technical experts in the design and delivery of programmes. Continual investment over the years has enabled the university to be ranked among the top universities in Ghana owing to its provision of high-quality education and training, and the excellence of its research output.

The university is increasingly exploring opportunities to improve its environmental management with the view to reduce its carbon footprint, reduce energy wastage and pollution, promote sustainable consumption, and increase renewable energy generation and consumption. Already, a green campus document has been prepared which is expected to provide a broader framework for all sustainable measures and interventions required to make the university carbon neutral in the foreseeable future.

The University faces a major challenge regarding the rising cost of electricity consumption, which has been increasing year after year. An analysis of electricity consumption on both campuses of the university reveals that the consumption rate has remained relatively stable at around $83,200 \pm 1400$

kWh per month from 2021 to 2023. As a result, an average of GHS 130,000 per month has been spent on electricity bills. However, as a result of an increase in student enrolment for the 2023/2024 academic year, the average monthly electricity consumption has risen to approximately 108,000 kWh. This has led to an average monthly expenditure of GHS 260,000. Additionally, a significant amount of money is spent on fuel for electricity generation during power blackouts.

In exploring long-term avenues to reduce consumption of grid electricity, a study was carried out in 2021 by Centre for Renewable Energy and Energy Efficiency of KSTU (CREK) to assess the feasibility of investing in standalone or grid-connected, roof-top photovoltaic (PV) systems on the main campus. It was established under the study that grid-connected systems could reduce consumption significantly with favourable financial rewards. Another study by CREK in 2021 revealed that significant electricity savings can be achieved through measures such as replacement of old air conditioners (ACs) with efficient ones, switching from Compact Fluorescent Lamps (CFLs) to Light Emitting Diodes (LEDs), use of automatic lighting systems, and a shift from desktop computers (and UPS) to laptops in administrative offices.

Considering the rising expenditure on electricity consumption, it has become necessary to plan and initiate programmes that can reduce the consumption of electricity, while promoting energy efficiency interventions. Savings on energy expenditure will enable the University to channel such funds to support investment in critical areas such as infrastructure, training

equipment, staff development and training of students. Such actions and measures will contribute to achieving of Sustainable Development Goal (SDG) 7 and directly contribute to Ghana's Nationally Determined Contributions (NDCs). It would also enable the university to reduce its carbon emissions and chart a path to carbon neutrality in the foreseeable future. In the long term, the policy will positively affect the following SDGs: 4 - Quality education, 8 - Decent work and economic growth, 9 - Industry, innovation and infrastructure, 11 - Sustainable cities and communities, 12 - Responsible consumption and production, and 13 - Climate action.

Purpose of the Policy

This policy has therefore been developed to provide clear-cut guidelines on energy related matters, activities and expenditure in the university with the view to improve the energy performance in all our campuses and activities.

CHALLENGES IN ENERGY CONSUMPTION AND MANAGEMENT

- The cost of energy consumption has been a major drain on the financial resources of the university. Past attempts and initiatives to reduce energy consumption and manage cost have been impeded by challenges which include:
- Increasing student enrolment and staff numbers;
- Limited space and floor area at the University's campuses resulting in pressure to increase use of buildings and longer operational hours;
- Expanding infrastructure and size of the University's estate;
- Increasing intensity of energy consumption within existing buildings to support teaching, learning, and research activities;
- Pressure on facilities due to longer operational periods including evening and weekend classes and student engagements;
- Limited financial resources due to inadequate subvention from government.
- Increase waste generation and disposal costs;
- Frequent power outages and subsequent dependence and management of generators; and

- High cost of investments into alternative energy resources such as solar PV and biodigesters.

AIM AND OBJECTIVES

The aim of this Policy is to provide a structured framework for responsible energy management and continual improvement in energy performance with the view to minimise the University's energy consumption, carbon emissions, and costs, and to meet the highest standards in energy efficiency.

The specific objectives of the policy are to:

- i. ensure continual investment in energy efficiency and conservation measures;
- ii. guide the procurement of quality energy efficient products and services;
- iii. implement proper metering systems for all buildings, ensuring seamless integration with the University's utilities database.
- iv. minimize carbon emissions and reduce reliance on national grid through investments in solar photovoltaics, anaerobic biodigesters and other renewable energy-based technologies;
- v. integrate passive solar design features into all new and renovated structures and facilities in compliance with appropriate standards;
- vi. minimise the expenditure on fuels in institutional vehicles by promoting sustainable business and commuter travels;
- vii. ensure proper collection, reuse/recycling, and disposal of discarded electrical and electronic equipment in accordance with best practices;
- viii. set-up annual funding for research and development into sustainable and renewable energy resources and energy efficiency & conservation; and

- ix. Create awareness and ensure effective education and engagement of stakeholders on best practices in energy consumption and conservation.

SCOPE

This policy is applicable to all buildings, facilities, and operations on all campuses of Kumasi Technical University as well as buildings and structures outside the campuses that are owned by the university. This includes, but is not limited to, academic buildings, administrative offices, student halls, residential facilities, laboratory and workshops, restaurants and canteens, dining facilities, sports complexes, and transportation services. The policy applies to students, staff and other interested parties such as visitors, external partners, suppliers and contractors, and other stakeholders.

PERFORMANCE TARGET

The target of the University's energy management policy is to reduce energy consumption and associated carbon emissions by 25% by 2030. The target is set for the year 2023 and will be reviewed annually by the Energy Management Team (EMT). The EMT will report their findings to Management, who will then decide on the necessary measures and actions to be taken.

STRUCTURE FOR IMPLEMENTATION OF THE POLICY

The EMT shall be formed under the office of the Vice Chancellor to coordinate all activities under this policy. The EMT will comprise five staff members who will be appointed by the VC for at least a period of two years. The composition of the EMT shall comprise:

- A chairperson who will be of professorial rank with several years of expertise in energy efficiency and conservation, renewable energy or related areas.
- A representative from CREK
- A representative from Works and Physical Development
- A representative from Electrical Engineering Department, or Energy and Environmental Management Department.
- A representative from Procurement Office.

6.1 RESPONSIBILITIES

6.1.1 Responsibilities of University Management headed by Vice Chancellor

The Management of the university, comprising the key officers, will provide the overall leadership and direction in the implementation of the policy. The role and responsibilities shall include:

- Ensuring that the energy policy, objectives, and energy targets are in line with the strategic plan of the University;
- Integration of the policy actions and measures into the University's operations;
- Approval and implementation of action plans and budgets;

- Provision of funding support and other resources for the implementation of the policy;
- Ensuring enforcement of policy requirements and attainment of policy targets;
- Ensure that effective governance structures are in place to review and authorised to supervise relevant actions; and
- Ensuring the formation of the EMT and appointment of members to serve on the EMT.

6.2 Responsibilities of EMT

The responsibilities of the EMT shall include:

- regular monitoring of energy usage and analyzing consumption patterns;
- conducting regular energy audits to identify areas of high energy consumption and potential areas for savings;
- gathering feedback from end-users in the university to assess the energy performance of purchased equipment
- promoting use of energy-efficient appliances and systems;
- preparing and presenting reports on energy consumption, savings, and the performance of implemented measures;

- assessing the efficiency of current energy systems and recommending improvements.
- sourcing and applying for grants or subsidies related to energy efficiency and renewable energy projects from partners and donors;
- monitoring changes in national energy policies and incorporating them in the revision of the energy policy; and
- ensuring compliance with national and international energy regulations and standards.
- educating staff, visitors, tenants of university buildings, and giving orientation to students about energy conservation practices and the importance of energy efficiency; and
- Working towards appropriate certifications and recognition for sustainability and energy efficiency.

6.3 Responsibilities of Director of Works and Physical Development

The Director of Works and Physical Development plays a major role in the implementation of the policy which will involve tasks such aimed at efficient use of energy resources, reducing consumption, and promoting sustainability in all campuses and properties. The responsibilities of the Director of Works shall include:

- ensuring that buildings and building services (air conditioning, etc.) are regularly maintained and operated efficiently;
- ensuring reduction in energy consumption in line with the policy within the available funding;
- overseeing the development and implementation of the energy policy;
- overseeing the upgrade and replacement of outdated or inefficient systems;
- developing and implementing energy conservation strategies to reduce overall energy consumption;
- implementing and managing the installation and maintenance of renewable energy systems;
- Preparing budgets for all energy management interventions for inclusion in the institutional budget; and
- providing training to university body on the proper use and maintenance of energy systems and appliances.

6.4 Responsibilities of Procurement Officer

The responsibilities of the Procurement Officer in the implementation of the policy shall include:

- purchase energy-efficient products and services in accordance with relevant provisions in the policy and

relevant energy efficient standards and performance criteria;

- liaising with various departments to determine their needs for energy-efficient equipment;
- purchasing energy equipment and services from certified suppliers;
- Ensuring that sustainability is integrated into the University's entire procurement process;
- Evaluating potential suppliers based on their ability to provide energy-efficient equipment and adherence to environmental standards, in addition to other relevant factors;
- Developing and issuing Requests for Quotations (RFQs) with criteria that include energy efficiency; and
- Ensuring that all procurement activities comply with relevant regulations and standards related to energy efficiency.

6.5 Responsibilities of Heads of Departments and Deans/ Directors

Sectional and Departmental Heads, Deans of Faculties and Directors will provide support towards the implementation of the Policy within their areas by:

- i. Coordinating awareness creation programmes on energy consumption and efficiency to staff and students;

- ii. Ensuring all staff and students under their mandate demonstrate good housekeeping practices in the workplace in the use of energy consuming equipment and gadgets;
- iii. Avoiding practices that waste energy and ensuring the use of energy efficient appliances in line with university decision;
- iv. Considering energy efficiency standards and life costs when making decisions to purchase new equipment;
- v. Reporting any changes in facility use and/or occupancy times to the appropriate office which will ensure effective monitoring in the use of electrical equipment in such facilities;
- vi. Promptly reporting all lighting and electrical related faults to the Estates Office;
- vii. Optimizing the use of accommodation space to maximize utilization;
- viii. Developing a utility reduction plan to support institutional energy reduction targets.

STRATEGIES FOR ACHIEVING THE OBJECTIVES OF THE POLICY

7.1 Procurement of electrical equipment

All procurement of gadgets, equipment, and services in the university are carried out by the Procurement Office in line with the Procurement Act, 2003 (Act 663) and the Public Procurement (Amendment) Act, 2016 (Act 914). The university procures various energy consuming equipment notably air-conditioners and refrigerators, laptops and computers, printers, photocopiers and scanners, fans, lamps and laboratory and workshop equipment for the various laboratories and workshops, among others.

The procurement of all electrical equipment shall strictly take into consideration the Energy Efficiency star rating of the Energy Commission wherever applicable. This means under no circumstances will the university purchase unrated equipment except on cases where there are no national standard for the equipment is available.

The procurement office shall take steps to ensure that:

- All ACs, refrigerators and freezers procured must have a minimum of three stars under the energy efficiency standards labelling of the Energy Commission;
- All light bulbs procured shall be LED and shall meet the minimum efficiency standard as given in Appendix A;

- Procurement of the following appliances shall be based on recommended minimum efficiency standards as given in Appendix A:
 - Inverters and solar panels
 - Fans
 - Computers
 - Electric kettles
 - Microwave ovens
 - Water heaters

Specific details are provided in Appendix A for various equipment.

7.2 Use of air-conditioners, refrigerators and freezers

- The University provides air conditioners to ensure the comfort of its staff and officers. However, electricity consumption from ACs comprise over half of total consumption from earlier studies which calls for optimisation in the use of ACs. It is recommended that during occupied periods, thermostats should be set to maintain a minimum internal temperature of minimum of 21 °C in all rooms and offices with ACs. When the space is not in use, air conditioners must be turned off.
- Unless there are valid reasons for keeping them running, all refrigerators and freezers shall be turned off during weekends.

7.3 Renewable and sustainable energy generation and utilisation

- i. The university has already commissioned several studies on incorporating solar PV systems into its energy consumption systems as a long-term strategy to reduce consumption, cost, and emissions. Discussions with leading solar PV construction companies have taken place in the past with the view to building collaborations for continual and incremental installation of grid-connected PV systems.
- ii. As part of a university-wide initiative, every opportunity will be explored to integrate renewable or low-carbon technologies into existing buildings and structures. This will include solar hot water for the restaurant, solar lamps and lighting stems, solar pumps for boreholes, solar-powered external lights and biodigesters for treatment of liquid waste.
- iii. New construction projects will be required to incorporate renewable or low-carbon energy sources such as roof-top PVs which shall account for at least 5% of the expected total energy demand. In addition, the university shall fund the installation of at least 50 kW grid-connected PV system every year for the next ten years. Passive solar technologies shall be required in all new buildings to reduce the energy consumption and carbon footprint while maximising natural ventilation and lighting.

7.4. INTERNAL INVESTMENT

In order to ensure that the university achieve its target in energy consumption reduction, the university will commit a dedicated fund annually into solar PV systems. Further, the university led by the EMT will source for technical, logistical and financial support from government, private sector and donor agencies to support its efforts in ensuring renewable energy generation and integration. In addition, the university will leverage on its expertise to develop proposals to seek financial support and flexible financial packages to invest in energy efficiency systems.

7.5 BUILDING OPERATION AND MAINTENANCE

- To achieve effective and efficient building operation and maintenance, it is crucial to establish a constructive partnership between University academic staff, students, and support staff. The responsibility for controlling energy usage generally falls on the building occupants themselves, who must take responsibility for conserving energy and turning off equipment when not in use. Faculties and Departments are responsible for managing energy consumption within their respective units and to promote best practices in equipment usage.
- The Estates Department is responsible for ensuring that the building structure and services that impact energy consumption are properly maintained and operated as efficiently as possible. The Estates Office will ensure that:

- operation of air conditioning equipment and lift systems are optimised;
- buildings and related services are regularly inspected and maintenance schedules are followed;
- all necessary inspections and testing procedures are followed;
- effective communication channels for reporting faults and energy waste are provided to all stakeholders;
- reported faults are promptly attended to, and defective equipment are replaced with the most cost-effective and energy-efficient solution whenever possible;
- building, equipment, and services are safeguarded as valuable assets of the university; and
- Install metering where feasible to enable monitoring of energy usage.
- The Estate Department and EMT will ensure that all users of buildings shall be expected to:
 - responsibly use all building facilities and energy-consuming services and equipment;
 - convey any opportunities for reducing energy waste to the Estate Officer;

- notify the Estate Office of any faults or instances of energy waste; and
- adopt good housekeeping habits, such as turning off equipment and lights when they are not in use.

7.6 Metering and wiring of buildings

- Progressively, existing buildings and blocks shall be separately metered to enable tracking of consumption to enable specific measures to be tailored to individual buildings. In order to promote efficient and responsible electricity usage among students, it is necessary to install prepaid meters in all hostel rooms. These meters will be used for both ECG power supply and generator usage. By implementing this system, students will be compelled to control their electricity consumption. Additionally, the dual functionality of the prepaid meters will facilitate the university's ability to accurately charge students for the generator power they use.
- New buildings must have their own meters and should not be connected to the University's overall meter. The electrical wiring in all new or renovated buildings across all campuses of the University shall be divided into different load categories which may include AC and light loads. Whenever technically and economically feasible, existing buildings will be rewired with separate wiring for different load categories.

7.7 Energy efficiency in buildings

Motion sensors, occupancy sensors and timer switches in offices, washrooms, corridors, and outdoor lighting controllers shall be progressively pursued and installed to avoid wastage of electricity. These measures shall apply to student halls.

7.8 Reduction in fuel and transportation expenditure

The university owns and manages various vehicles and commuter buses in the discharge of its operations which result in the use of fossil fuels. Thus, the university possess great potential to reduce emissions through the sustainable management of its transportation system. Strategies to reduce the fuel consumption and transportation expenditure shall include:

- procuring low emission vehicles in line with appropriate guidelines;
- transition to electric vehicles in the medium to long term;
- promoting carpooling and ridesharing
- encouraging the use of public transportation with appropriate incentives whenever necessary

7.9 Engaging students, staff and the wider community in sustainable energy practices

To promote sustainable energy practices, it is important to engage students, staff, and the community through education, practical implementation, community involvement, and incentives. This will enable KSTU to create a culture of sustainability through the participation of all stakeholders. The following initiatives shall be pursued:

- Conducting a needs assessment in the field of energy is an important step in comprehending the specific requirements, challenges, and opportunities in the university. CREK should conduct a needs assessment to gather data and information, as well as identify gaps and develop effective strategies for promoting awareness creation;
- Faculties and Departments shall include awareness creation sections focusing on energy conservation and energy efficiency in their orientation programmes for fresh students;
- Faculties and Departments shall include topics on sustainable energy practices in seminars and workshops that they organise, with leading experts invited from academia and industry;

Relevant staff at the Works and Physical Development Directorate, Procurement and others shall be supported to undergo regular training in sustainable energy;

- Student bodies and associations shall include educational topics on sustainable energy practices during their week celebrations and other campus programmes;
- CREK will initiate and set up demonstration projects on campus to raise awareness among students, staff, and visitors about solar, biogas, and other renewable energy sources. Flyers, posters, and other promotional materials should be created and displayed in offices and classrooms, as well as shared on all institutional platforms;
- CREK shall partner student associations and industry to organise competitions that challenge students to develop new technologies or practices in sustainable energy;
- The EMT shall partner local schools, businesses, and organizations to foster the adoption of sustainable energy practices.
- The EMT and CREK shall initiate collaborations local authorities, national institutions, donors, industry, and Civil Society Organisations (CSOs) to create and execute sustainable energy innovations.
- The EMT shall recommend to Management the recognition of individuals, groups, departments, and faculties that make noteworthy contributions to sustainable energy practices on campus.

- The EMT will create channels for students, staff, and community members to provide feedback on sustainable energy initiatives.

7.10 Strategies to integrate sustainable energy education and research into the university curriculum and activities

- The Quality Assurance and Planning Department (QAPD) shall ensure that Departments incorporate sustainable topics into existing courses, whenever applicable;
- The QAPD shall ensure that the Departments create specialized and advanced courses in renewable energy, sustainable energy consumption, energy efficiency, and green buildings which will be integrated into existing programs.
- The University has already developed a series of generic courses that cover a wide range of subjects. These courses are designed to provide students with a well-rounded education and to help them develop a diverse set of skills that are necessary for a productive life and informed citizenship. The courses aim to enhance critical thinking and problem-solving abilities, improve communication skills, promote African culture and diversity, instil ethics and professionalism, and build computer skills;
 - a. The QAPD will ensure that relevant generic courses on sustainable energy are developed and included in the curricula of all programs at the university.

- b. CREK will assume the leadership role in liaising with Departments to develop relevant generic courses that can be seamlessly integrated into the curricula of the university's programs. Generic courses shall include every aspect of renewable energy, sustainable energy consumption, energy conservation, energy efficiency, green buildings and passive solar technologies, energy audit and policy, among others.
 - c. Where appropriate, CREK shall work with relevant offices to incorporate virtual labs and simulation tools into the curriculum to offer students engaging and interactive learning experiences.
- The Institute for Distance and Continuing Education (IDCE) shall collaborate with CREK and other departments as well as industry experts to develop and run online certificate programmes in sustainable energy;
- The University shall set up a fund to support undergraduate projects and post-graduate research that focus on any area of sustainable energy, or a prioritized thematic area;
- The EMT shall ensure that laboratories and research centers are equipped to facilitate energy studies, research, and hands-on learning;
- The Industrial Liaison Office (ILO) shall support Departments to initiate partnerships with industry to provide real-world projects and case studies in sustainable energy. The ILO will also assist Departments

to Organize field trips and site visits to renewable energy facilities and energy - efficient buildings;

- The EMT shall initiate capstone projects that require students from various disciplines to collaborate on developing sustainable energy solutions for specific energy challenges facing the university;
- The EMT shall identify and invite industry experts and professionals from the sustainable energy sector to give guest lectures on current trends, technologies, best practices and policies in sustainable energy;
- CREK shall partner the Dean of Students and student associations to form Student Club to initiate student-led research projects, activities and campaigns in sustainable energy;
- The International Affairs Unit shall spearhead research collaborations and student/staff exchange programmes with international institutions in sustainable energy and related areas.

MONITORING AND REVIEW OF THE POLICY

- The effectiveness of the policy will be monitored annually by the Energy Management Team and a report submitted to Management for review and critical decisions to be taken.
- This policy will undergo regular reviews and revisions every two years, or as necessary, to ensure that it aligns with technological advancements, regulations, national policies and institutional priorities.

APPENDIX A

RECOMMENDED ENERGY EFFICIENCY AND/OR POWER RATINGS FOR VARIOUS APPLIANCES AND LAMPS

Electrical equipment/appliance	Guideline	Recommendation
Air conditioners	Minimum of 3-star rating	Inverter type ACs are recommended
Fridges	Minimum of 3-star rating. Max of 80 W for offices and student halls.	Inverter type recommended. Restaurants and other special offices may have higher capacities.
Freezers	Minimum of 3-star rating	
Television sets and monitors	Minimum of 4-star energy efficiency rating	Energy Efficiency Index shall be less than 0.60
Fans	Minimum of 5-star energy efficiency rating	Minimum service value shall be 4.75, 2.58 and 2.15 kW for ceiling fan, standing fan and table-top or wall mounted fan, respectively.

Light bulbs (LEDs)	Minimum of 4-star	Min. Energy Efficiency Index of 0.17. All non-directional lighting needs shall be LED
Computers	Should pass specific minimum energy performance standards as specified in L.1. 2446	
Microwave oven	Minimum of 4-star	Energy consumption per cooking cycle should be at least 48 Wh
Electric kettle	Minimum power efficiency of 92%, with power consumption in auto shut-off mode not exceeding 1.5 W.	
Electric cooker (student halls)	Maximum of 1600 W	
Electric iron (student halls)	Maximum of 1600 W	

Inverters	Minimum of 3-star	Power efficiency not below 92%
Solar panels	Minimum efficiency standard based on LI 2449.	