# SDG.7.3.1

1. In accordance with “Energy Conservation Action Plan of government agencies and schools” issued by the Executive Yuan, NUK will reduce the annual electricity consumption by at least 1% every year. At the beginning of each year, it regularly fills in the non-production industry energy verification network reporting system and uses the system to analyze and understand the main carbon emissions of the school.
2. NUK's carbon emissions decreases yearly. Its carbon emissions are published in the annual sustainability report and on the webpage (https://ces.nuk.edu.tw/p/412-1011-5978.php?Lang=en) for public viewing. The summary is as attached.

Attachment 1



▲ Smart Cloud Management System Webpage

▲ Classroom Air Conditioning System Website

## 5.2.2 Green Energy

1. The Administration Building and the Law College set up their own solar panels to generate electricity with a total capacity of 36.4kwp and applied for 15 renewable energy certificates.
2. In conjunction with the Million Rooftop PUs Project, the entire school building rooftops are equipped with solar power generation system bid lease, with a total of 2,142.960kwp and generated about 2.74 million kWh in 2024
   1. Replacement and installation of energy efficient equipment:The University has been budgeting for the replacement of traditional appliances with energy efficient equipment since 2018. Compared to the base period in 2015, the average energy-saving appliances have been improved by over 81%, over 75%: and the electricity bill has been saved by over $2.55 million per year. In 2024, depending on the annual funding budget, the following are completed:
      A. Replacement of power-saving air-conditioning $2,289: 10 buildings have completed more than 9 air-conditioning using inverter-type installations (10/13=77%).
      B. Replacement of LED lighting fixtures $184,000: over 85% of the lighting fixtures in the school buildings and roads around the school have been replaced with energy-saving LED lighting fixtures.
      C. The improvement of the average energy-saving electrical appliances has exceeded (85+77)/2=81%, which is more than 75%

▼ List of solar power generation equipment

| Site | Yr/Mon Installed | KWp | Mode of operation | MW 2023 | MW 2024 |
|---|---|---|---|---|---|
| College of Law | 2004/12 | 26.400 | REC | 8,185 | 7,968.6 |
| Admin. BL | 2013/08 | 10.000 | REC | 2,917 | 2,367.8 |
| College of Engineering | 2019/12 | 209.450 | FIT | 282,144 | 279,352 |
| Library & Info BL | 2019/12 | 348.395 | FIT | 482,184 | 472,284 |
| College of Management | 2019/12 | 93.810 | FIT | 120,116 | 116,876 |
| 1st General BL | 2019/12 | 154.875 | FIT | 209,696 | 206,344 |
| Admin. BL | 2019/12 | 57.525 | FIT | 78,716 | 78,292 |
| Student Dorm | 2020/01 | 56.640 | FIT | | |
| Duty Accommodation | 2020/01 | 50.445 | FIT | 467,532 | 461,088 |
| Motor-and-Bicycle Parking Lot | 2020/01 | 246.620 | FIT | | |
| Sport & Leisure BL | 2022/06 | 581.060 | FIT | 797,650 | 784,050 |
| Student Activity Center | 2022/10 | 307.700 | FIT | 401,460 | 332,454 |
| Total | | 2,142.920 | | 2,850,599 | 2,740,806 |

FIT : Feed-in Tariff REC : Renewable Energy Certificate

◀ Solar Panels

## 5.2.3 Effectiveness of Energy Saving Measures

In order to implement campus energy management and energy saving measures, energy saving strategies such as energy saving control management, retirement and replacement of power-consuming equipment, and utilization of renewable energy, as well as various action plans such as centralized power monitoring system, retirement and replacement of old air-conditioning system, and solar power system, have been formulated. From 2015 to 2024, the electricity saving rate reached 11.84%, and the EUI indicator will be reduced from 58.8 to 31.4.

## Construct Sustainable Campus Environment

The major strategies and actions of electricity conservation measures are listed in the table below:

| | Action plan | Description |
|---|---|---|
| Energy-saving control and management | Central electricity monitoring system | Network function of digital electricity gauge was used to conduct on-line monitoring and controls on the electricity usage of each buildings. |
| | Implement self-management on spaces | Self-management system on electricity bills will be implemented for each buildings in order to conduct "users pay" policies and save energy. |
| | Installation of electricity gauge in independent units and outdoor court | Independent electricity gauge will be set up to monitor the electricity usage of independent units and outdoor courts for the affiliated units to conduct electricity calculations and controls. |
| | Adjustment on the starting and stopping time of air conditioning | Implement the rules that air conditioning will not be supplied for administration building and general classroom during winter season (from December to March next year). |
| | Adjustment on opening hours of the library and information center | Different opening hours will be established for each space regarding its function and usage frequency. Those spaces will not be opened during Weekends of Winter and Summer Vacations. |
| | Participate in the demand-based price competition measures of taiwan power company | Participate in the demand-based price competition measures of Taiwan Power Company to save energy and electricity bills |
| Replace old electricity consumption equipment with new ones | Implementation of intelligent classroom step-by-step | For the project, we applied network cloud technology and used low carbon and energy-saving as our focus to implement intelligent air conditioning schedule management in teaching spaces such as general classrooms and seminar rooms at the 6 teaching buildings of the school. Users may send in real time through course arrangement system and space borrowing system, organize air condition monitoring and database management and implement comprehensive fully automatic air conditioning schedule control, temperature monitoring and the on off procedure control to enhance the correctness and liability in the management of air conditioning for classrooms, reaching the objectives of facilitating sustainable development of environment and enhancing the quality of learning environment. |
| | Replacing old Air conditioning system with new ones | Budgets were prepared to replace the old air conditioning system with frequency-conversion air conditioner system. Replacements have been completed in College of Science and College of Engineering. |
| | Replacing lightings with LEDs | Budgets were prepared to replace old light bulbs with LEDs. Replacements have been completed in campus circulating roads, streetlights at the parking lots and the classrooms of each buildings and seminar rooms. |
| Utilization of renewable energy | Replacing old air conditioning system with new ones | Student dorms adopts solar power hot water system 100% to provide hot water. |
| | Replacing lightings with LEDs | 1. Administration building and College of Law installed solar power panels for electricity generation themselves. The total electricity generated was 36.4 kwp. In addition, they have applied for 15 renewable energy certificates.<br>2. To cooperate with the "million sun rood" plan, we have installed standard solar power generator system on the roof of all the school buildings. In total, 2217.02 kwp was installed. |

▼ Electricity Consumption Statistics

| Year | Total/kw | Total/GJ | Year over 2015 | TOE | EUI |
|---|---|---|---|---|---|
| 2015 | 14,201,510 | 51,084.57 | - | 1221.9 | 58.8 |
| 2016 | 14,528,086 | 52,259.30 | -2.27% | 1250 | 37.1 |
| 2017 | 14,090,386 | 50,684.84 | 0.81% | 1212.3 | 36 |
| 2018 | 12,884,463 | 46,346.99 | 9.27% | 1108.6 | 33 |
| 2019 | 12,970,796 | 46,694.89 | 8.67% | 1116 | 33.2 |
| 2020 | 12,733,420 | 45,840.31 | 10.28% | 1095.6 | 32.6 |
| 2021 | 11,292,628 | 40,620.97 | 20.43% | 971.6 | 28.9 |
| 2022 | 11,959,686 | 43,020.46 | 15.79% | 1029 | 30.6 |
| 2023 | 12,274,980 | 44,154.76 | 13.57% | 1056.1 | 30.9 |
| 2024 | 12,520,011 | 45,036.17 | 11.84% | 1077.2 | 31.4 |

EUI =Total electricity used (kWh)/NUK Total floor area

2015 was selected as the base year for the implementation of the Central Four-Saving plan.

## Fuel Saving Measures

Two measures are taken to save fuel: a. Regular maintenance and inspection of the school's official vehicles are carried out to maintain efficiency and to save fuels; b. When replacing aged official vehicles, the purchase priority is given to the ones with high efficiency and low fuel consumption. The total fuel consumption in 2024 is 5102.56 liters, which represents a fuel saving of 17.69% compared to the base year 2019. However, if compared with 2023, an increase of 2.59% occurred due to the use of diesel fuel on campus for tree pruning equipment and vehicles in result of more natural disasters. In 2024, however, there were more natural climate disasters, resulting in an increase in usage.

▼ Statistics on Fuel Consumption

| Year | Gasoline/L | Diesel/L | Ttl Fuel Consumption/L | TOE | Fuel saving (%) |
|---|---|---|---|---|---|
| 2019 | 5,227.26 | 880.41 | 6,107.67 | 4.8 | - |
| 2020 | 4,774.51 | 1,424.93 | 6,199.44 | 4.9 | -1.50% |
| 2021 | 5,690.06 | 847.16 | 6,537.22 | 5.2 | -5.45% |
| 2022 | 4,492.70 | 432.82 | 4,925.52 | 3.9 | 24.65% |
| 2023 | 4,418.62 | 554.88 | 4,973.50 | 3.9 | 18.57% |
| 2024 | 4,524.55 | 578.01 | 5,102.56 | 4.0 | 17.69% |

d. Our greenhouse gas emissions are as follows.

| GHG Inventory Category | GHG Emission Source | MTCO2e/Yr |
|---|---|---|
| Category 1. Direct GHG Emissions and Removals | **Total** | **149.7564** |
| 1.1 Stationary Combustion | Emergency generator (diesel) | 9.6745 |
| 1.2 Mobile Combustion | Public Transportation Vehicle (Gasoline & Diesel) | 12.1790 |
| 1.3 Industrial process emissions (direct process emissions from school operations) | Lab alcohol for Combustion (Methanol, Ethanol, Others), Lab Specific Gas Cylinders (CO2, N2O, Gas, Acetylene), Lawnmowers (Diesel) | 2.4904 |
| 1.4 Fugitive emissions | Refrigerant (air conditioning, refrigeration & freezer equipment, bus air conditioning), septic tanks, fire extinguishers (dry powder, CO2, foam extinguishers) | 125.4125 |
| 1.5 Land Use, Land Use Change and Forestry Emissions | NI | 0 |
| Category 2. Input energy indirect GHGe | **Total** | **5,776.3739** |
| 2.1 Indirect emissions from imported electricity, including GHGe from the production and consumption of imported electricity by the related organization. | School Electricity - Purchased Electricity | 5,776.3739 |
| 2.2 Indirect emissions from energy inputs, incl. GHGe from energy consumption (steam, heat, cooling and compressed air) of the organization's production through the physical network, except for emissions from electricity. | NI | 0.0000 |
| Category 3. Indirect GHGe from transportation | **Total** | **562.2858** |
| 3.3 Emissions from employee commuting | Employee commuting | 249.4679 |
| 3.5 Emissions from business or employee travel and transportation | Faculty/staff/student travel (by high-speed rail, Taiwan Railway, air, and MRT only) | 312.8179 |
| Category 4. GHGe between products used by the organization | **Total** | **1,291.3295** |
| 4.1 The organization purchases GHGe from raw material extraction, manufacturing and processing. | Procurement of electricity, water, gasoline and diesel for school | 1,176.4162 |
| 4.3 Disposal of emissions from solid and liquid wastes depend on the characteristics of the waste and its treatment. Typical treatment types are landfill, incineration, biological treatment or recycling processes. | Waste incineration, waste removal and transportation | 114.9133 |
| Category 5. Indirect GHGe derived from products of user organization | **Total** | **362.9148** |
| 5.2 Emissions from downstream leased assets | Outsourced manufacturers lease electricity, tap water, and natural gas | 362.9148 |
| **Total** | | **8,142.660** |

* The latest version of the announced GWP value is the IPCC 6th Assessment Report (2021), so the IPCC 6th Assessment Report (2021) is used.

▲ NUK Inventory of GHG Emissions, 2023 (Base Year)

## Action Plan 2: Campus Climate Action

### 1. Description of Current Status:

A. Global climate change is a critical issue for mankind, and we are a member of the Green University and one of the participants in global environmental protection. In 2019-2020, the University received funding from the Architectural Research Institute of the Ministry of the Interior and the Kaohsiung City Government to renovate the student dormitories into smart-energy residences, and to install a smart-energy management system and a centralized power monitoring system. For electricity usage, digital meters are installed in each building on campus to collect data on electricity usage in each building, and a "Power-BI" webpage has been built to provide students and faculty with information on electricity usage and remind them to conserve energy in order to fulfill their responsibilities as citizens of the earth.

B. In addition to the improvement of hardware and equipment, the environmental regulations and management of the University should also be included in climate issues. In response to the SDGs: 6, 13, 15 and UI Green Metric World University Rankings, the University intends to take stock of the current status of environmental and climate-related issues and regulations during 2023-2026, and to examine the potential risks in management in order to take measures to effectively reduce and eliminate them.

### 2. Implementation Strategies and Practices

A. The University's Sustainable Climate Change Program, which participates annually in UI Green Metric World University Rankings - Energy Climate Change, Education and Research (SDG 13).

a. Revise the Chinese and English sustainability reports annually and participate in the evaluation.

b. Participate in UI Green Metric World University Rankings annually to review annual implementation.

c. Inventory campus carbon emissions and develop medium- and long-term options for reducing emissions.