7.2.4 An energy efficiency plan to reduce overall energy consumption

Alexandria University implements an integrated energy efficiency plan focused on reducing overall energy consumption through optimized systems, renewable solar and wind integration, and smart control and monitoring technologies. The University applies advanced analysis, performance evaluation, and energy conservation methods to enhance building efficiency, improve energy utilization, and lower carbon emissions. By expanding photovoltaic systems, deploying efficient equipment, and upgrading infrastructure through data-driven optimization, Alexandria University strengthens its transition toward renewable energy, sustainable development, and long-term environmental stability.

Alexandria University – Energy Efficiency Plan to Reduce Overall Energy Consumption

SDG 7: Affordable and Clean Energy | THE Impact Rankings – Indicator 7.2.4

Alexandria University has documented evidence of an institutional energy efficiency plan, including measures to reduce electricity consumption across faculties, institutes, and administrative facilities.

The official university documents covering the 2024–2025 reporting period, including a specific SDG 7 evidence category, an institutional energy conservation initiative, and reported reductions in energy consumption.

Evidence 1 – Official SDG 7 Energy Efficiency Plan (2024–2025)

Alexandria University's sustainability portal explicitly identifies an energy efficiency plan to reduce overall energy consumption under its 2024–2025 SDG 7 documentation.

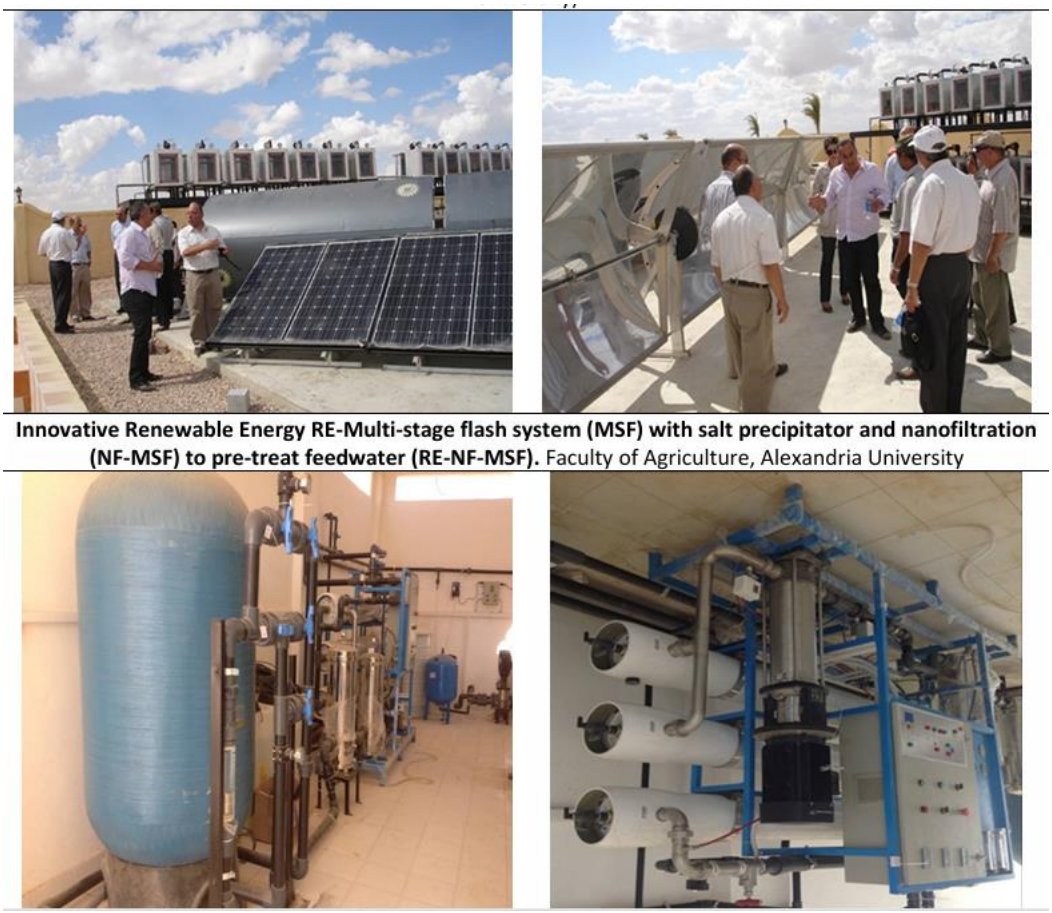
Evidence 2 – University Energy Conservation Committee (16 January 2025)

The Community Service and Environmental Development Council discussed establishing a committee responsible for rationalizing electricity consumption across university faculties and institutes, consistent with Egypt Vision 2030.



Evidence 3 – Sustainability Report 2024–2025

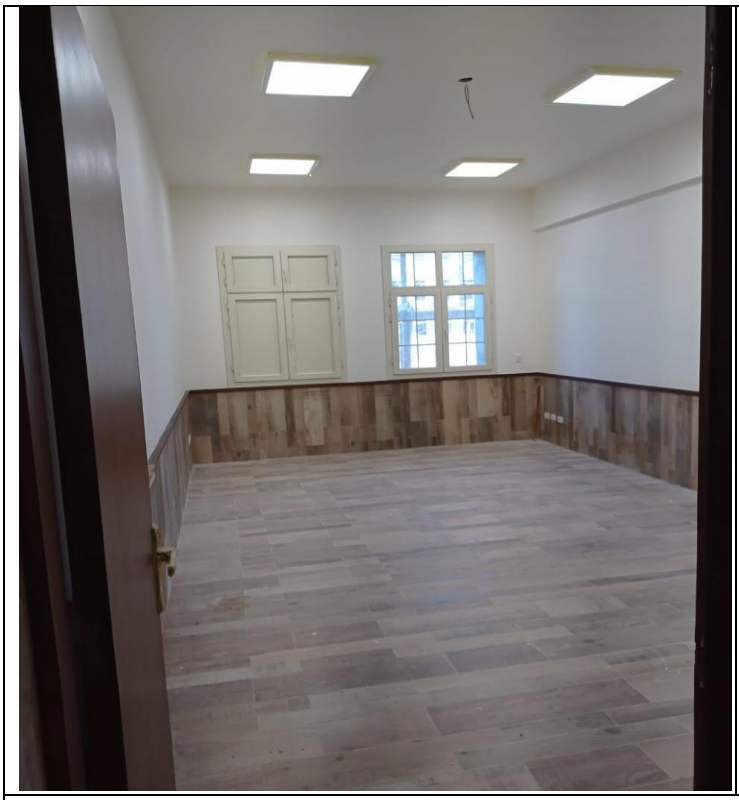
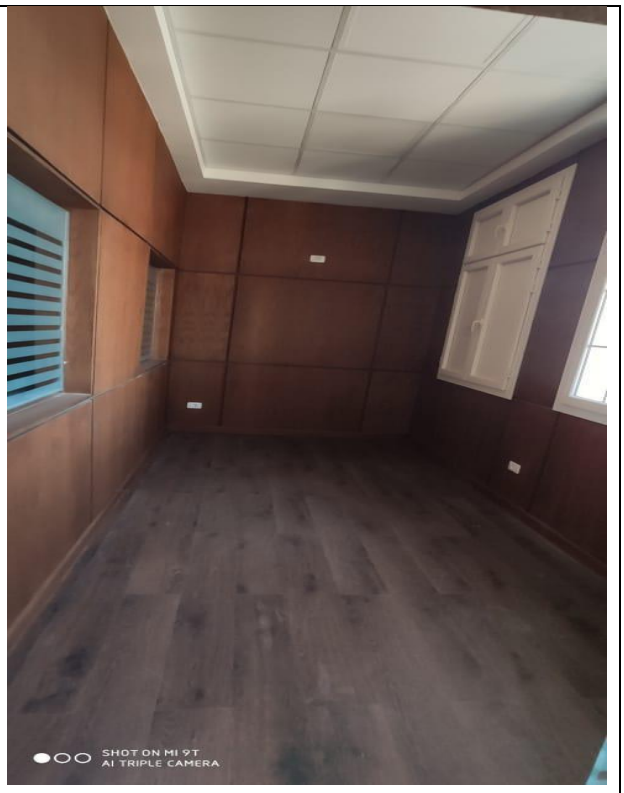
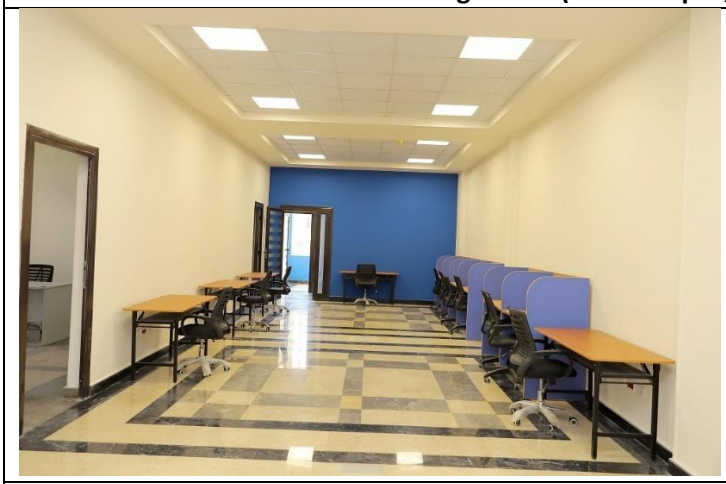
The report provides quantitative electricity, renewable energy, natural gas, and carbon footprint indicators, supporting the assessment of energy management performance.



Innovative Renewable Energy RE-Multi-stage flash system (MSF) with salt precipitator and nanofiltration (NF-MSF) to pre-treat feedwater (RE-NF-MSF). Faculty of Agriculture, Alexandria University

Evidence 4 – Energy Efficiency Implementation Programme

- **Alexandria University Project on Using LEDs as Energy-Efficient Bulbs**
  Within the framework of the University's keenness to transform into a green, environmentally friendly university that works to enhance its resources and rationalize energy consumption, the Department of Community Service Development has launched a project for the total transformation of the used LED bulbs instead of the fluorescent ones. The light-emitting diode (LED) bulbs are more efficient, and energy-saving compared to fluorescent bulbs, with a relatively longer life span.
  The project has been implemented in phases since 2019 based on the preparation of an inventory of the total numbers needed for all faculties and institutes of the university. The first quarter, the numbers required, which represents the types of 60 cm, 120 cm and 9 watts' bulbs, has been spent and installed, which are almost 30%. In parallel, appropriate measures were taken to dispose of the lost fluorescent lamps through one of the companies concerned with safe disposal. The second step required the purchase and transformation of 37% of the total needs of the faculties and institutes of the university. The third step required the purchase and transformation of 25% of the total needs of the faculties and institutes of the university. During the last phase, the transformation of all remaining LED bulbs was performed.

<table>
<tr><td></td><td>
</td></tr>
<tr><td colspan="2">Teaching rooms (Abis Campus, Alexandria University)</td></tr>
<tr><td></td><td></td></tr>
<tr><td>All teaching rooms contain well-equipped technological facilities (screens, data shows, and white boards).</td><td>Smart screens are used in all lecture halls</td></tr>
</table>

2. Quantitative evidence from 2024–2025

Alexandria University's sustainability report provides the following reported figures:

Reported electricity consumption **4,228,996** kWh

Reported electricity reduction **6.42%** Compared with the report's stated reference period

Renewable electricity production **1.21 million** kWh/year

Renewable electricity share **28.69%** Of reported electricity consumption

The above figures shows that Alexandria University implements an institutional energy efficiency plan aimed at reducing overall energy consumption, improving building performance, and promoting sustainable energy management across its faculties, institutes, and administrative facilities.

The plan incorporates the phased replacement of conventional lighting with energy-efficient LED systems, the procurement of inverter air-conditioning units, the installation of motion-activated lighting controls, regular equipment maintenance, and operational measures to reduce unnecessary electricity consumption.

In January 2025, the University's Community Service and Environmental Development Council discussed establishing a university-wide committee to oversee electricity conservation, strengthening institutional coordination and accountability.

The University's 2024–2025 Sustainability Report records electricity consumption of approximately 4.23 million kWh and reports a 6.42% reduction relative to its stated reference period. Renewable electricity production was reported at approximately 1.21 million kWh annually, equivalent to 28.69% of electricity consumption.

These documented policies, operational measures, and reported performance indicators demonstrate Alexandria University's commitment to systematic energy conservation, sustainable infrastructure development, and continuous improvement in institutional energy efficiency.

- **Renewable Energy Sources in Campus: 1,228,291.2 kWh/year**
  Renewable energy:

1) **Solar Thermal Systems:** Solar collectors generate renewable thermal energy to support heating and hot water demands and complement building energy systems.
2) **Wind Energy:** Wind turbines convert wind energy into renewable electricity to support campus operations and reduce dependence on conventional energy sources.
3) **Biodiesel Production:** Biodiesel derived from biological feedstocks such as plant oils, used cooking oil, and other renewable organic materials serves as a cleaner alternative fuel for energy generation and operational activities.
4) **Green Hydrogen:** Hydrogen produced through water electrolysis using renewable electricity (e.g., solar or wind power) serves as a clean energy carrier that can support electricity generation, thermal applications, and future low-carbon energy systems, including CHP applications where implemented.
5) **Biomass Energy:** Biomass utilization includes advanced conversion technologies such as carbonization, torrefaction, gasification, pyrolysis, and biochar production, contributing to renewable energy generation and efficient resource utilization.
6) **Waste-to-Energy Systems:** Organic or biodegradable waste is converted into useful energy, with CHP applications enabling simultaneous production of electricity and recoverable heat.

Together, these renewable energy technologies contribute to increasing renewable energy production, improving energy efficiency, reducing greenhouse gas emissions, and supporting sustainable campus development and smart building implementation.

	
Automatically Controlled Biodiesel Production Unit. (Faculty of Engineering, Alexandria University)	Activated carbon cloth from biomass fibrous resources (Faculty of Engineering, Alexandria University)
	
Design and Fabrication of Biodiesel Burner test rig. (Faculty of Engineering, Alexandria University)	Green Hydrogen/Diesel Dual-Fuel Retrofit: A Scalable Pathway to Industrial Decarbonization (Faculty of Engineering, Alexandria University)



Design of Integrated Augmented Vertical Axis Wind Turbine (VAWT) With Solar Energy System for High Rise Urban Applications (Faculty of Engineering, Alexandria University)



Experimental and Simulation Study of Natural Gas–Hydrogen/Diesel RCCI for Engine Decarbonization (Faculty of Engineering, Alexandria University)



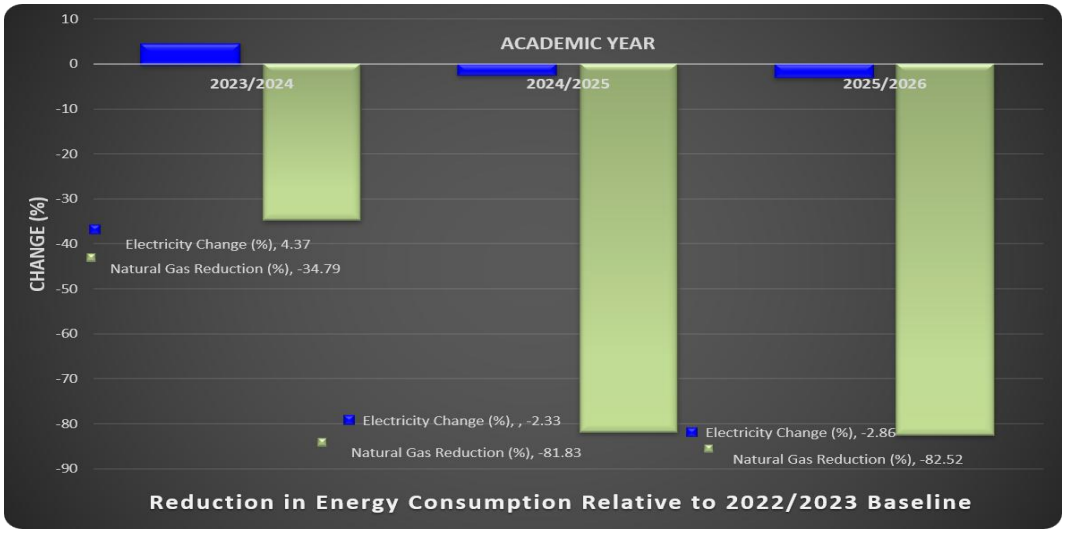
Solar Energy Center at the Faculty of Agriculture (Alexandria University)



Windmill and Solar Panels (Solar Energy Center at the Faculty of Agriculture - Alexandria University)

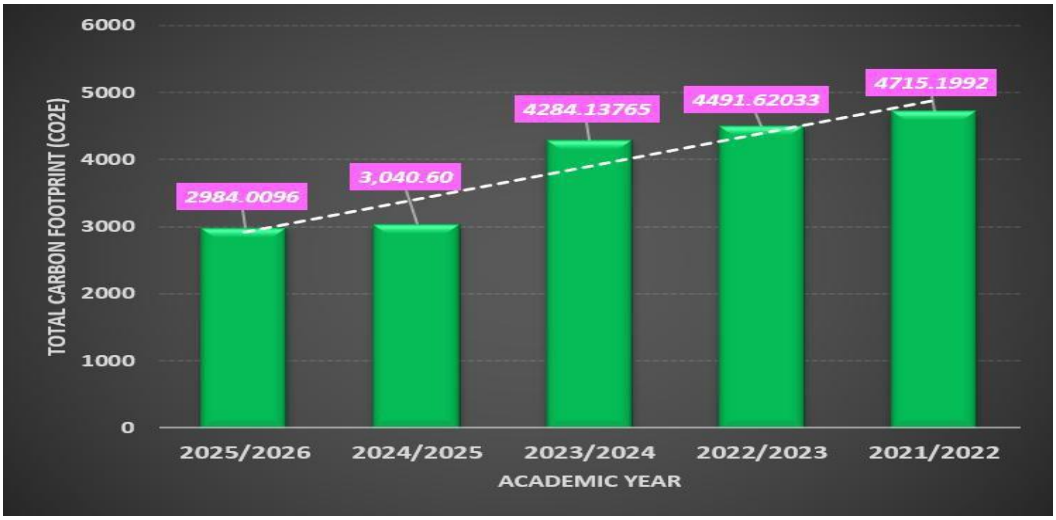
- **Improvement in Energy Efficiency**

  Alexandria University continues to improve energy efficiency through targeted energy management initiatives and infrastructure upgrades. Compared with the 2022/2023 baseline, natural gas consumption decreased significantly by **34.79%** in 2023/2024, **81.83%** in 2024/2025, and **82.52%** in 2025/2026. Electricity consumption also declined by **2.33%** in 2024/2025 and **2.86%** in 2025/2026, following a temporary increase of **4.37%** in 2023/2024. These results demonstrate the University's ongoing commitment to reducing energy consumption, improving operational efficiency, and lowering greenhouse gas emissions in support of the Sustainable Development Goals and Egypt's Vision 2030.



- **Reduction in Carbon Footprint**

  Alexandria University has achieved a continuous reduction in its carbon footprint through the implementation of energy-efficient technologies, renewable energy initiatives, and sustainable campus management practices. As shown in the figure, total carbon emissions decreased from **4,715.20 tCO_2e** in the 2021/2022 academic year to **4,491.62 tCO_2e** in 2022/2023 and **4,284.14 tCO_2e** in 2023/2024. This downward trend continued with emissions declining to **3,040.60 tCO_2e** in 2024/2025 and further to **2,984.01 tCO_2e** in 2025/2026. Overall, the University achieved a reduction of approximately **36.7%** compared with the 2021/2022 baseline, reflecting its commitment to climate action, energy conservation, and the transition toward a low-carbon and sustainable campus



- **Alexandria University Program to reduce Electricity consumption from Air Conditioners and electric devices such as Computers, printers, photocopiers, surveillance cameras.**
  1. All newly purchased AC are inverter AC to reduce the electricity consumption.
  2. The new electric devices such as Computers, printers, photocopiers, and surveillance cameras are energy efficient devices.
  3. All electronic devises must be shut down at night, when not used.
  4. Passive Infrared (PIR) Sensors were implemented in some Faculties for motion-activated lighting to detect changes in heat signatures when someone or something moves within the sensor's range. These sensors will be implemented in phases in for all faculties and institutes of the university.
  5. Regular Maintenance of all devices.
  6. The thermostats of the air conditioner are set at 25°C, and direct sunlight is avoided by using sun protection curtains.

- **Advanced Solar Complex Design Project**

  The implementation of an advanced solar complex design project has been completed. The project aims to synthesize biofuel from agricultural and food industry waste and is located at the research and production farm of the Faculty of Agriculture, Saba Basha, Alexandria University. It is funded by the Science, Technology & Innovation Funding Authority (STDF) and executed through a collaboration between the Faculty of Engineering at Alexandria University and the Desert Research Institute at the City of Scientific Research and Technological Applications (SRTA-City), situated at the tenth village in Abis.

  The solar complex area is 300 square meters and comprises a system of reflective mirrors that concentrate solar radiation onto a solar collector. Ambient air is introduced at a controlled velocity and heated from 25°C to approximately 500°C using the concentrated solar energy. The heated air is then directed to a heat exchanger to produce biochar from various types of agricultural waste. Additionally, the hot air is utilized in a solar dryer for dehydrating a wide range of agricultural products, including vegetables, fruits, and fodder.

  This solar complex serves as a green hub at the Saba Basha agricultural farm, harnessing clean solar energy for biofuel production and drying processes without reliance on electrical power. Consequently, it

contributes to environmental preservation and the reduction of carbon dioxide emissions. The solar dryer also holds future potential for seawater desalination and clean electricity generation, representing a developmental pathway for optimal utilization of the system.

