

7.2.4 An energy efficiency plan to reduce overall energy consumption

Energy Efficient Appliances Usage

Alexandria University intends to realize further energy savings by paying close attention to energy management. All the faculties and institutes of the university realize their own energy-saving potential by means of LED lighting and the deployment of sustainable technology.

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.



Energy Efficient Appliances Usage: Use of LED lighting and lamps (New Abbas Campus, Alexandria University)

Alexandria University Program to reduce Electricity consumption from Air Conditioners and electric devices such as Computers, printers, photocopiers, surveillance cameras.

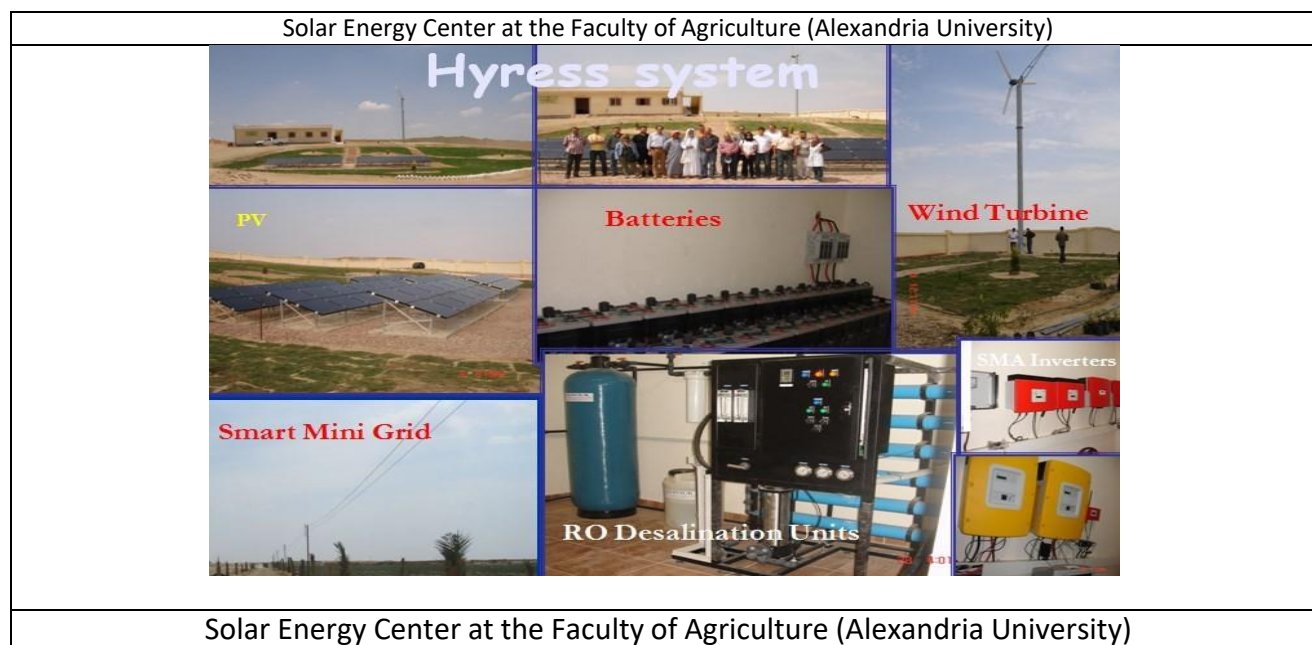
1. All newly purchased AC are inverter AC to reduce the electricity consumption.
2. The new electric devices such as Computers, printers, photocopiers, and surveillance cameras are energy efficient devices.
3. All electronic devices must be shut down at night, when not used.
4. Passive Infrared (PIR) 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.

Renewable Energy Sources in Campus

The Faculty of Agriculture has 2 renewable energy centers and on center at the main building of the University.

- 1) The renewable Energy Center in Wadi El-Natroon. There are two units from the network:
 - 7 kw hybrid unit for photovoltaic cells and 5 kw for air turbine.
 - 50 kw hybrid unit for photovoltaic cells and 50 kw for air turbines (under maintenance). They are all used in student training and research for graduate students and faculty members.
- 2) The renewable Energy Center at the Agriculture Research and Experiments Station in Abis Campus.
 - The capacity of the center is 130 kw/h connected to the electricity grid.
- 3) The renewable Energy Center at the main building of the University.
 - The capacity of the center is 20 kw/h connected to the electricity grid.





The Faculty of Science:

Research Project: Development and implementation of decentralized solar-energy-related innovative technologies for public buildings, in the Mediterranean Basin.

System Application	Number of modules	Solar System kWp	Power (kWh)
BIPV façade brise-soleil	120	17.28	26350
BIPV garden pergola	90	8.1	23270
BIPV roof pergola	30	4.1	
	Total Power (kWh)		49,620

Environmental Benefits

Life time CO ₂ emission savings	556,935 kg
Life time SO ₂ emission savings	2,004 kg
Life time NO _x emission savings	668.322 kg

University administration building

The project of "supplying, installing and operating the photovoltaic solar plant with a capacity of 20.1 kW above the administration building of Alexandria University in Shatby was launched by the Arab Renewable Energy Company, on 2/14/2020. The capacity of the station per month is 20.1 kW, while the capacity consumed from the building is 255 kW / month, meaning that the station provides within 8% of the total monthly consumption. Total Solar energy per year =**241.2 kWh**



BIPV Façade Brise-Soleil System
Solar Energy Project at the Faculty of Science (Alexandria University)

Higher Institute of Public Profession

The Institute has two initiatives to exploit solar energy at the Institute through two units of photovoltaic cells (50 watts each) that are currently installed and are exploited to provide the electrical energy necessary to operate the Ultra- Filtration unit located in one of the laboratories of the Department of Materials Science for educational purpose.

Moreover, five units of photovoltaic cells (260 watts each) were installed to operate the discussion room at the Institute and to provide it with sufficient energy for lighting purposes and to operate its display device. Total Solar energy per year = **360 KWh**.

The Faculty of Engineering

The implantation of the new Solar Station is completed. The implementation of the solar photovoltaic panels was performed in December 2022 with a capacity of **220** kilowatts on the 2000 m² roof top of the building of the Mechanical Engineering Department at the Faculty of Engineering.

Alexandria University have generalized this initiative in some of the faculties of Alexandria University in gradual stages.



Solar photovoltaic with a capacity of 220 kilowatts on the 2000 m² roof top of the building of the Mechanical Engineering Department at the Faculty of Engineering



Green building implementation through the use of sun breakers in the SSP building at the Faculty of Engineering

Renewable energy production per year

No	Renewable Energy	Production (in kWh)
1	Solar panel	$57,150 + 49,620 + 241.2 + 360 + 220 = 107,591.2$
2	Windmill	55,000
	Total	162,591.2

The European Union project to convert several buildings of Alexandria University into green buildings by reducing energyconsumption in addition to establishing solar-powered powerstations in 2023-2024

- In light of the keenness to rationalize energy consumption in university buildings and the general trend to increase the percentage of reliance on new and renewable sources in electricity production, and in cooperation with the European Union, the European Union funding was accepted for a project to transform some buildings of Alexandria University into green buildings by reducing energy consumption in addition to constructing Electrical power stations powered by solar energy on the roofs of some qualified faculty and institute buildings suitable for this purpose.
- Accordingly, three buildings belonging to the university's faculties were chosen as a first stage to study the feasibility of applying the project to them in terms of the building's ability to bear the weight of solar stations to produce electricity, as well as studying the spaces available for building these stations and the extent of those spaces' exposure to solar radiation throughout the day. The opportunities available to reduce reliance

on usual energy sources were also studied in terms of using more efficient lighting, increasing reliance on natural lighting during the day, and reducing the building's air conditioning loads.

- After research and review, the specialized scientific programs will be developed in the Faculty of Engineering, the Faculty of Education building within the Literary faculties Complex, and the Manchester Building in the Faculty of Medicine, which were chosen due to the recent construction of these buildings and their ability to accommodate the proposed development in terms of the electrical load network and the development of air conditioning systems and water heating systems used in laboratories and bathrooms.
- These buildings were visited and their suitability for the project was evaluated. The current electricity consumption and the possibility of covering these loads with electricity generated from solar energy were studied. The roof areas facing south and suitable for establishing solar stations were inspected and raised. The available roof area in the Specialized Scientific Programs Building at the Faculty of Engineering, Alexandria University, was 2,400 square meters. It can be used to create a solar station with an area of 1,000 square meters with a capacity of **120 kilowatts**, so that the station will be able to generate **360 megawatt hours** of electricity annually. As for the Faculty of Education building, the total area of the building was 4,000 square meters, and the appropriate spaces for building the station accommodate 1,000 square meters of solar cells with a capacity of **120 kilowatts**, so that the station is capable of generating **360 megawatt hours** of electricity annually, and for the Manchester building at the Faculty of Medicine, 1,200 square meters is capable of accommodating a solar power station with an area of 800 square meters. With a capacity of **96 kilowatts**, the station is capable of generating **288 megawatt hours** of electricity annually. These stations also contribute to reducing carbon dioxide emissions by a total of approximately 214 tons annually. The total expected cost of the project is about 300,000 euros.
- The time to recover the capital was estimated through providing the electricity consumed in the three buildings for approximately seven years from the date the stations entered service at full capacity, considering the periodic maintenance necessary to continue the station's operation with the greatest possible efficiency. Detailed reports were also prepared for each building and submitted to the general coordinator of the project, for review and to take the necessary steps to start this vital project, which is an important step in strengthening the efforts of the Egyptian state towards switching to renewable energy and reducing dependence on fossil fuels that have a negative impact on the environment



The European Union project to convert several buildings of Alexandria University into green buildings by reducing energy consumption in addition to establishing solar-powered power stations: the Specialized Scientific Programs Building at the Faculty of Engineering, the Faculty of Education Building within the Literary Colleges Complex, and the Manchester Building at the Faculty of Medicine.

New European Union Project for Renewable energy production (Solar panels)

No	Location	Production (in kWh)
1	Faculty of Engineering	360,000
2	Faculty of Education	360,000
3	Faculty of Medicine	288,000
	Total	1,008,000

The total Renewable energy production per year in Alexandria University after the implementation of the European Union project to convert several buildings of Alexandria University into green buildings

No	Renewable Energy	Production (in kWh)
1	Solar panel	$57,150 + 49,620 + 241.2 + 360 + 220$ $= 107,591.2$
2	Windmill	55,000
3	New Solar panels in 2023-2024	$360,000 + 360,000 + 288,000$
	Total	1,170,591.2