7.2.4. Plan to Reduce Energy Consumption

2023–2024

AASTMT is quite concerned with energy conservation and consumption reduction. Thus, annually AASTMT Energy Management Committee updates its plan to execute procedures towards further consumption rationalization and emissions reduction as well as infrastructure renovations towards higher energy efficiency, besides expansion in renewable energy installations. To evaluate these measures, annual insights of university energy consumption and emissions are compared to check the progress towards Green Sustainable Energy. Related AASTMT annual plans, insights and progress reports are found on AASTMT webpage in the link below.

AASTMT Annual Energy Plans on AASTMT webpage
AASTMT Annual Insights on AASTMT webpage
AASTMT Annual Energy Progress Reports on AASTMT webpage

2023/2024 AASTMT Plan to Reduce Energy Consumption

In 2023/2024, Energy Management Committee put forward several strategies to reduce and rationalize electrical consumption in AASTMT campuses. These measures are detailed in AASTMT 2024 plan towards Green Sustainable Energy and their effectiveness are validated in AASTMT 2024 Energy Progress Report, as summarized below.

AASTMT 2024 Plan towards Clean Sustainable Energy on AASTMT webpage
AASTMT 2023/2024 Energy Progress Report on AASTMT webpage

2024 AASTMT Measures to Reduce Energy Consumption

AASTMT energy saving measures include regular measures that are continuously carried out as well as renovation and upgrading ones that are updated yearly as follows;

1. AASTMT Regular Measures

- Smart building management systems and online real-time regular monitoring to energy consumption for efficient energy management (load priorities determination and energy use optimization in major campus buildings, thus reducing electricity waste and improving operational efficiency).

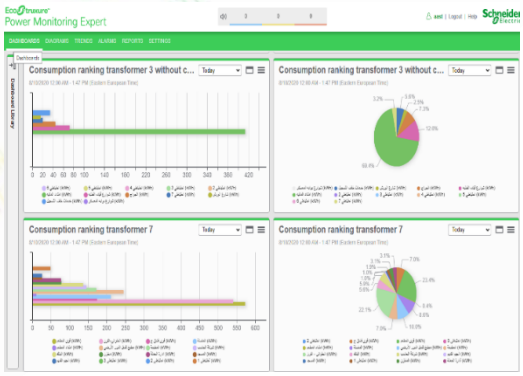


Figure 1. Schneider Electric-based online metering in AASTMT

- Spreading instructions and directions towards energy saving and conservation as per the letter addressed to all AASTMT campuses from AASTMT president.
  Letter addressed to all AASTMT institutes from AASTMT president regarding energy saving

- Increasing awareness regarding energy rationalization and conservation plans among AAST staff, students, administrators and technicians through energy-related campaigns, initiatives and seminars as shown in the Events Section found in the following link:
  Energy-related Events

2. AASTMT 2024 Upgrading and Renovation Plan

Besides, the pre-discussed regular energy saving procedures, AASTMT sets buildings' renovation and upgrading plan all over its campus annually. In each campus, data from local meters at each building is collected to analyze energy use of this building during different times and identify its subjection to energy wastage or energy inefficiencies. Buildings with highest wastage are to be selected for internal audits and measures are to be taken towards these buildings in the form of;

- Prioritizing BMS tuning (scheduling, set-points, and alarms), targeting HVAC, and light controls in high-use spaces.
- Implementing power factor correction panels as well as upgrading electrical outlets and accessories.
- Completing the replacement of lighting lamps and working with LED lamps as was planned for 2024.
- Applying motion-sensor lighting in common areas.
- Increasing the operating efficiency of many air-conditioning systems (energy-efficient HVAC systems).
- Applying continuous electrical maintenance procedures.

Examples of such measures ae vivid in the 2024 renovation measures executed in AASTMT Alex. campuses as well as the new energy-efficient buildings established in AASTMT Alamin branch. This is discussed in details in indicator 7.2.2.

➢ Alexandria Branch Campuses

This branch is annually renovated since it features multiple campuses, oldest infrastructure and largest number of staff and students i.e. highest energy consumption and energy wastage. 2024 renovations in all AASTMT Alex. campuses are discussed in details in *2024 Buildings Upgrading and Energy Conservation Report in AASTMT Alex. Campuses*

➢ Alamein Branch Campus

In ElAlamein branch, the installation of College of Medicine has been finished in 2024. Thermal characteristics of walls, glasses and roofs have a strong impact on the cooling load and chilled water demand of a building. To obtain a properly sized and energy-efficient cooling system, a thermal efficient building shell is utilized in the design with the following specifications:

- Maximize light colors for roofing and wall finishes materials.
- Install high R-value wall and ceiling insulations.
- Use minimum glass on east and west exposures.
- Use windows with low shading coefficient (SC) such as double glass windows and roof, however with shaded curtains.
- Minimizing electrical loads from lighting by using light sensors to benefit from natural lighting as much as possible during day-time.
- Implementing recommended lighting intensity as per ASHRAE 90.1-2007 and also LED luminaries to minimize heat built up.
- Use motorized shading systems -curtains that can be opened or closed based on sunlight intensity, room temperature, or time of day - for optimal cooling adjustment, thus enhancing AC energy efficiency as well as benefit from natural light and ventilation in case of cool days.

Validation of 2024 AASTMT Measures Using 2024 Energy Usage Insights

To evaluate AASTMT 2023/2024 energy saving procedures, 2024 AASTMT energy usage is detailed in AASTMT 2022/2023 Insights Report.

AASTMT 2024 Energy and Carbon Insights

Regarding Energy consumption in all AAST branches all over Egypt (Alexandria, Aswan, Port-Said, Alamin, Sheraton, Smart village and Dokki), Fig. 2 demonstrates 2024 electrical energy consumption % in all AAST campuses with a total of 19,055,865 kWh. It is clear that more than half of AASTMT electrical consumption is concentrated in AASTMT Alexandria campuses, thus energy consumption insights will be first analyzed in this huge branch, followed by insights analysis throughout the whole AASTMT branches.

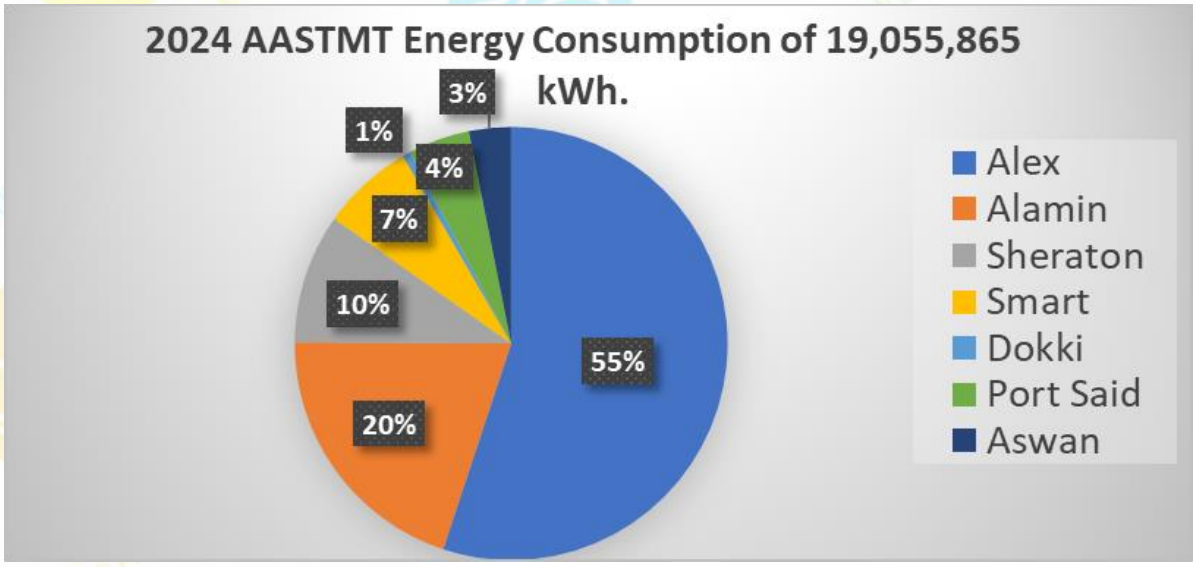


Figure 2. 2024 Energy Consumption in all AAST campuses in %

➢ Electrical Energy Consumption in All Alexandria Campuses

First, energy consumption in all campuses of AASTMT Alexandria branch is analyzed since this branch experiences the highest consumption due to its multiple campuses and largest number of staff and students. Fig.3 shows the total energy consumption in the entire Alexandria Campuses within the period (2018-2024). It is clear that comparing the latest consumption in 2024 (10498097 kWh) by the baseline in 2018 (12698059 kWh) results in a total of 17.33% reduction in energy consumption.

Within the period 2019-2021, AASTMT wasn't working at full capacity due to Covid19. However, after Covid19, AASTMT capacity gradually increased until all the branches returned to their full load in 2022 with a total value of 11,257,258 kWh. Following the yearly renovation and modernization plan implemented across all Alexandria branch buildings of the Academy, energy savings are achieved in electricity consumption in 2023 by 2.5% resulting in energy consumption of 10,972,312 kWh. Proceeding in the energy saving yearly procedure, 2024 witnessed energy consumption of 10,498,097 kWh with a significant decrease of 4.32% from 2023.

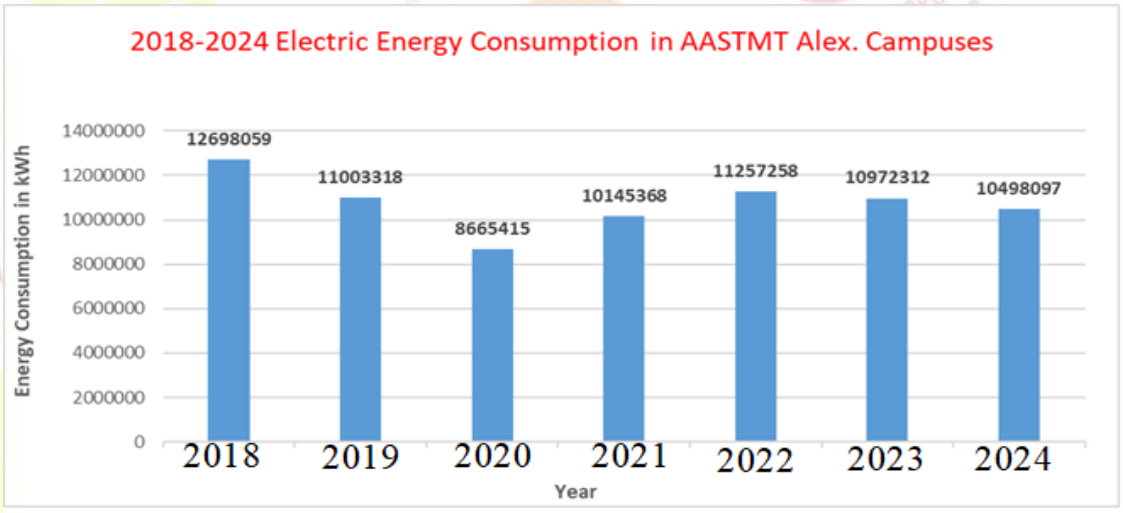


Figure 3. Total Electrical Energy consumption in kWh of AASTMT Alexandria campuses (2018-2024)

➢ Energy Consumption in all AAST Branches All Over Egypt

Comparing the energy consumption of all AAST campuses for the years 2023 and 2024, as illustrated in Fig.4, it is noted that the average reduction in all campuses is about 4-5% with a reduction in the total consumption by around 4.3%, from 19,917,470 kWh in 2023 to 19,055,865 kWh in 2024, reflecting AASTMT progress towards energy saving in all its branches.

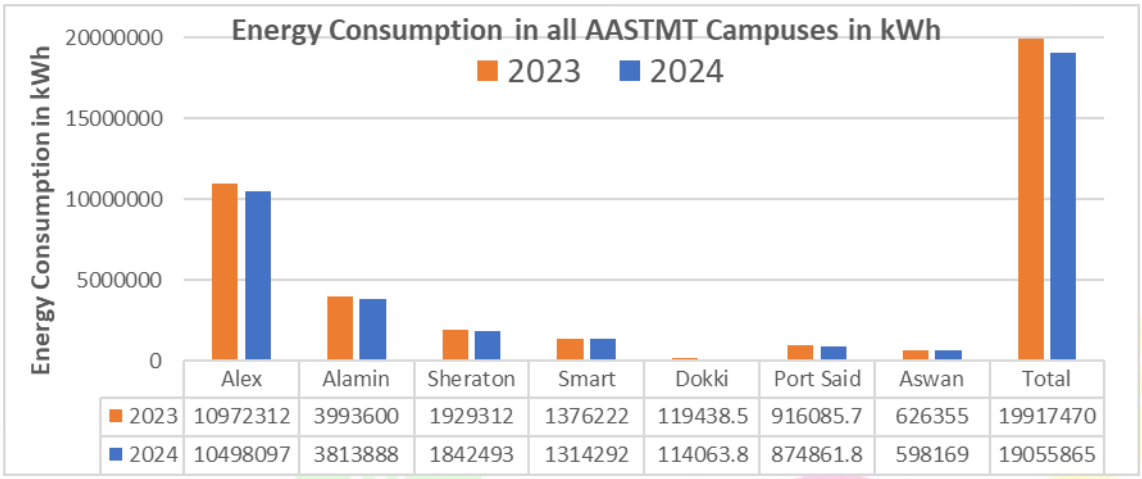


Figure 4. Comparison between 2023 and 2024 energy consumption in all AASTMT branches

Table 1 shows the entire AAST energy density, including energy from national grid and from AASTMT total solar installations, in kWh/m^2 and GJ/m^2 in 2024 compared to that of 2023. The calculated energy density reached about 0.09363GJ/m^2 in 2024 which is less than the 0.09785GJ/m^2 in 2023 by almost 4.3%, mirroring AASTMT continuous efforts towards electrical energy conservation and energy efficiency improvement. Also, it is worth noting that AASTMT total energy consumption from low carbon sources (summing up RE sources share in national grid and solar installation in AAST), has reached 17494GJ in 2024 which is more than the 17271GJ in 2023 by almost 1.29%, reflecting AASST support to transition to clean energy.

Table 1. Energy Density in GJ/m^2 for the entire AAST in 2024 compared to 2023

Year	Total Floor Area (m^2)	Total energy (kWh) (from Grid + AAST solar infrastructure)	Total energy (GJ) (from Grid + AASTMT solar infrastructure)	Density (GJ/m^2)	Energy from low carbon sources (GJ)
2023	735569.7	19,992,470	71972.892	0.09785	17271
2024	735569.7	19,131,865	68874.714	0.09363	17494

2022/2023 AASTMT Plan to Reduce Energy Consumption

In 2022/2023, Energy Management Committee put forward several strategies to reduce and rationalize electrical consumption in AASTMT campuses. These measures are detailed in AASTMT 2022/2023 plan towards Green Sustainable Energy and their effectiveness are validated in AASTMT 2022/2023 Energy Progress Report, as summarized below.

AASTMT 2022/2023 Plan towards Clean Sustainable Energy on AASTMT webpage
AASTMT 2022/2023 Energy Progress Report on AASTMT webpage

AASTMT 2022/2023 Energy conservation procedures are demonstrated below;

1. **Towards Energy Saving**

- Smart building management systems, applied in AASTMT, plays a critical role in improving energy saving. These systems allow online regular real-time monitoring which helps determining load priorities for efficient energy management and optimal

energy use in major campus buildings, thus reducing electricity waste and improving operational efficiency.

- Increasing awareness regarding energy rationalization and conservation plans among AAST staff, students, administrators and technicians through energy-related campaigns, initiatives and seminars as presented in the Events Section at sdg7 webpage:
  Energy-related Events on AASTMT webpage

- Spreading instructions and directions towards energy saving and conservation as per the letter addressed to all AASTMT campuses from AASTMT president.
  Letter addressed to all AASTMT institutes from AASTMT president regarding energy saving

2. Towards Higher Energy Efficiency

Upgrading AASTMT infrastructure to higher energy efficiency, contributes noticeably in reducing energy consumption. Thus, AASTMT 2022/2023 measures in this aspect are discussed in details in *AASTMT 2022/2023 Plan towards Clean Sustainable Energy* and summarized below .

- Completing the replacement of lighting lamps and working with LED lamps as was planned for 2022/2023, where replacement rate rises to more than 95%, leading to a significant reduction in electricity consumption.
- Applying motion-sensor lighting in common areas.
- Increasing the operating efficiency of many air-conditioning systems (energy-efficient HVAC systems).
- Applying regular electrical maintenance procedures.

To evaluate AASTMT 2022/2023 energy saving procedures, energy usage in all AAST campuses all over Egypt (Alexandria, Aswan, Port-Said, Alamin, Sheraton, Smart village and Dokki) are compared in 2022 and 2023 as shown in Figure 1 and detailed in AAST 2022/2023 Insights Report.

AASTMT 2022/2023 Insights

It is noted that the average reduction of energy consumption in 2023 compared to 2022, in all AASTMT campuses except Alamin Campus, is 2.5% while the average reduction all over the campuses including Alamin is around 2%. This can be related to the fact that Alamin Campus is a new campus and the capacity of the campus increases regularly each year until the full occupation. Energy consumption reduction in 2023 compared to 2022 validate the effectiveness of AASTMT plan towards energy saving and efficiency.

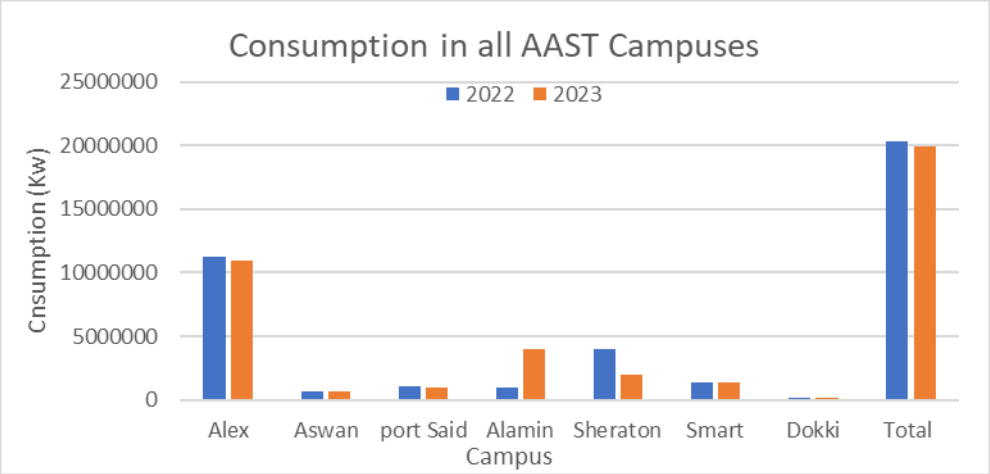
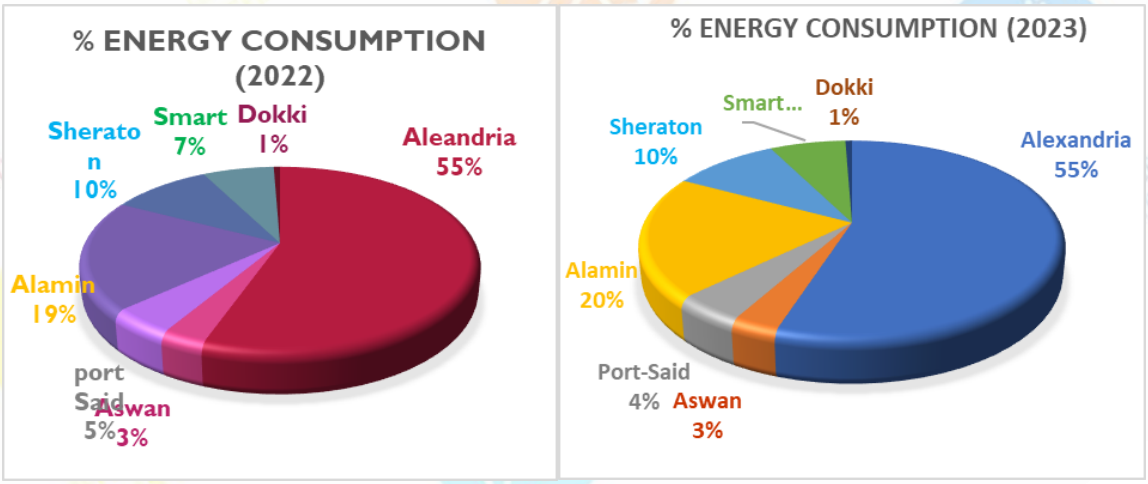


Figure 1. Comparison between 2022 and 2023 energy consumption in all AASTMT campuses

Analyzing energy consumption in each AASTMT campus in 2022 and 2023, as shown in Figure 2, it is clear that Alexandria campus experiences the highest energy consumption due its multiple branches and relatively larger area and bigger number of students and staff. That's why, as discussed in 7.2.2. indicator, most renovations and energy conservation procedures were executed for Alexandria campus.



(a) *(b)*

Figure 2. % Energy Consumption in all AAST campuses in (a) 2022, (b) 2023

Hence, energy consumption of Alexandria different branches will be further analyzed to again verify the effectiveness of these procedures.

Figure 3 shows the energy consumption in the entire Alexandria Campus within the period (2018-2023). It is clear that the maximum consumption was in 2018 with a full load of 12,698,059 kWh before Covid19, then the lowest load in 2020 during Covid 19, then it gradually increased until all the branches returned to their full load in 2022 with a value 11,257,258 kWh, as well as 2023, with a value of 10,972,312 kWh.

Note that despite the return of total operation and the increase in expansions and new buildings, there is a decrease in the energy usage by 13.59%, in 2023 compared to 2018. Moreover, compared to consumption in 2022, a decrease in energy consumption in 2023 is evident by about 2.5% as shown in Figure 4 which verifies the effectiveness of AASTMT plan

and measures towards energy saving and efficiency in AASTMT entire Alexandria campus among all its branches.

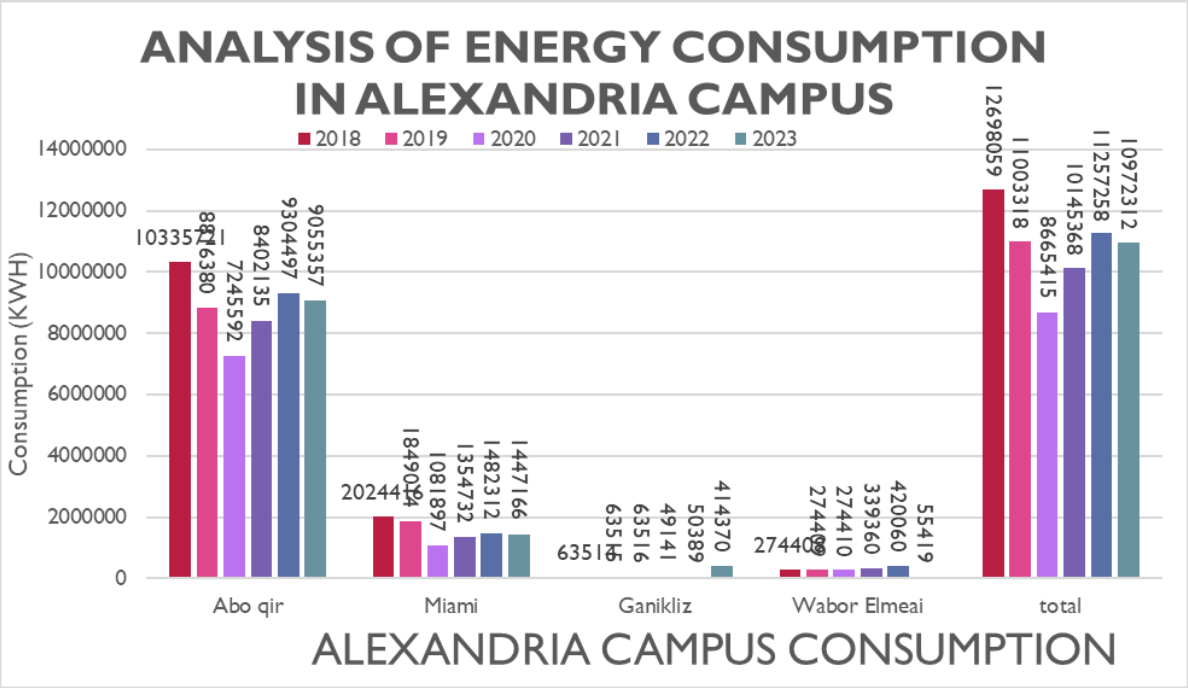


Figure 3. Energy consumption of AASTMT Alexandria campus (2018-2023)

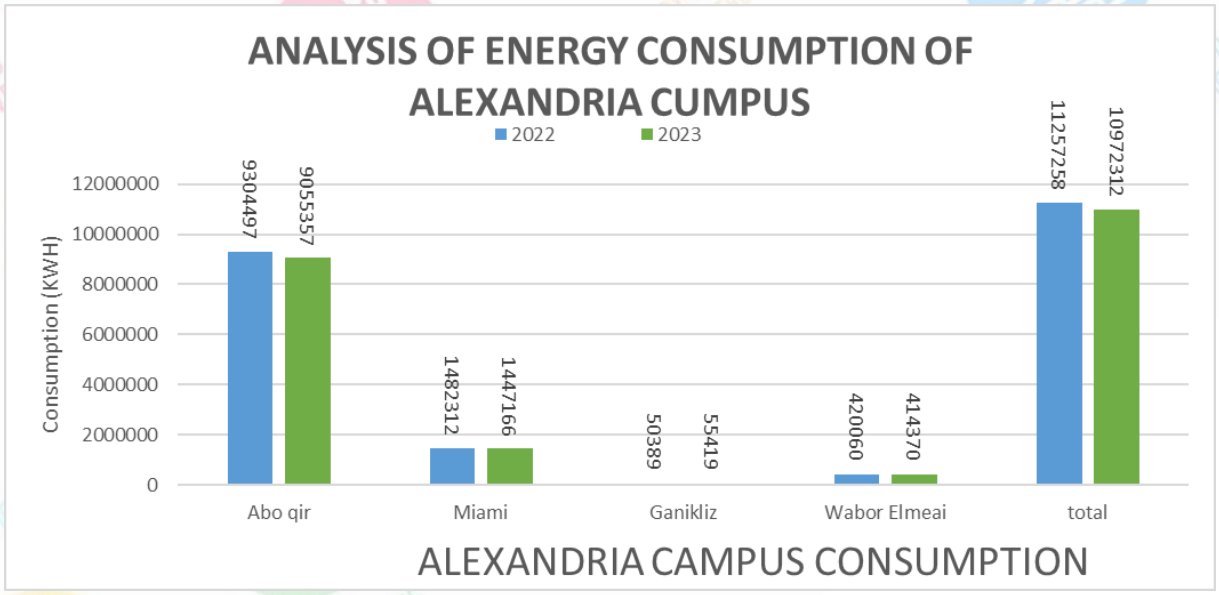


Figure 4. Zoom in energy consumption of AASTMT Alexandria campus (2022-2023)