



AASTMT Energy Progress Report – 2024

- ❖ 2024 Plan Towards Green Sustainable Energy
- ❖ Energy Consumption and Carbon Emissions' 2024 Insights

Towards Efficient, Clean and Renewable AASTMT:
“Save Energy, Cut Carbon and Empower with Renewables”



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1. Report Overview

This report highlights AASTMT's progress in its transition towards cleaner and more sustainable energy. It provides detailed updates on the university's efforts regarding energy efficiency and saving, renewable energy sources employment and carbon emissions reduction in its different AASTMT branches and campuses during the year 2024. Moreover, it deals with reviewing and updating 2024 rationalization and renovation plans, by analyzing load consumption as well as listing emissions insights within this period, to evaluate AAST plan and efforts in this context.

2. Executive Summary

In 2023/2024, AASTMT made significant progress towards: **Higher Energy Efficiency and Conservation, More Renewable Energy Employment and Less Carbon Emissions** in its campuses demonstrating a strong commitment towards **Sustainable Affordable and Clean Energy**. This includes measures, research and innovation as well as initiatives and campaigns to meet Egypt overall goal to “**Boost the share of power generated by renewable energy resources to 42% by 2040 and reducing green-house gases emissions by 50% by 2040**”.

In 2024, with particularly significant improvements in energy efficiency and decarbonization aspects, the university successfully achieved the following,

- Energy consumption reduction in 2024 by almost 4.3% from 2023 and total 17.33% from 2018
- Total carbon emissions reduction in 2024 by 3% from 2023 and total of 32.8% from 2019.
- Increasing the RES share of AASTMT energy demand to over 25% in 2024.

This confirms AASTMT achievement in exceeding its short-term goal of realizing 30% carbon reduction target and supplying 25% of university demand from renewables by 2025. Moreover, it puts well with its long-term goal of achieving a 50% carbon reduction and 40% renewables share by 2040.

3. Objective

The scope of this report focuses on evaluating AASTMT's ongoing continuous efforts towards energy efficiency and saving, carbon footprint reduction as well as improved renewable energy employment within **2024**, based on related insights. Thus, this report discusses **the university's measures and plans** towards realizing the interim targets set in the updated **AASTMT Green Energy and Energy Management Policy (2023-2026)**. Moreover, it provides detailed insights into AASTMT's **energy consumption and energy use density, renewable energy usage and carbon emissions level in 2024** to monitor the outcome of AASTMT's energy-related efforts, verify its progress towards clean energy sustainability and track its advancements towards its long-term goal.

4. Measures and Insights

AASTMT puts vast efforts annually towards three main aspects,

- Energy Conservation and Efficiency
- Renewables Empowerment
- Decarbonization Procedures

To evaluate AASTMT 2024 plan and assess its progress in this context, AASTMT measures, with respect to each of the above aspects, are discussed separately followed by the related insights to evaluate these efforts as given by AASTMT 2024 plan and 2024 insights reports found in the links below

[AASTMT 2024 Plan towards Clean Sustainable Energy](#)

[AASTMT 2024 Energy and Carbon Insights](#)

1. Towards Higher Energy Saving and Efficiency

To support continuous electric energy conservation and enhance energy efficiency within its campuses, AASTMT takes consistent measures that are continuously carried out, besides infrastructure upgrading and renovation plans that are updated yearly. This is reflected in reduction in the energy consumption among all its branches

A. AASTMT Measures

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;

i. 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).
- Data from local energy meters in each building are used to track building energy use during different times (day/night, weekdays/weekends, and seasonal variations) to identify periods of high and low demand. Differences between peak energy consumption and off-peak consumption are compared to identify potential overuse or unnecessary use. Hence, buildings of high energy wastage will be selected for internal audits to identify reasons of energy inefficiencies and take suitable measures to rationalize energy consumption in such places.

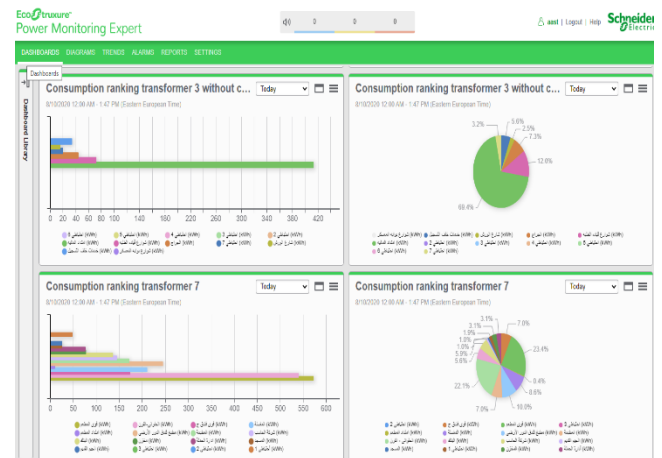


Fig. 1: Schneider Electric-based online metering in AASTMT

- Continuous checking for unnecessary use of energy in high energy wastage buildings where lighting, air conditioners or computers are left on even if the place is unoccupied.

- 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](#)

ii. **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 subsection 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.

➤ **Alexandria Branch Campuses**

The measures discussed in this subsection are to be taken in 2024 for each campus of **Alexandria branch** (This branch renovations are discussed in details since it features multiple campuses, oldest infrastructure and largest number of staff and students i.e. highest energy consumption and energy wastage);

[2024 Energy Conservation Report](#)

First: Abou Qir Branch

- Upgrading lighting at the new gym entrance with **20 spotlights (5 W)**.
- Upgrading electrical outlets, data points, and lighting on the **entire 4th floor of Housing Hotel C**.
- Upgrading electrical outlets and accessories on the **entire 2nd floor of Housing Hotel E**.
- Upgrading lighting in **4 classrooms on the 4th floor of the Architecture Engineering Building** with **50 LED fixtures**.
- Upgrading lighting in all **corridors of Engineering Buildings C and D** to LED with **100 fixtures**.
- Upgrading lighting in **8 classrooms of Building D (Marine)** with **40 LED fixtures**.
- Installing **2 power factor correction panels** for **2 UPS units** in the Financial Affairs Building.
- Installing **2 control panels** for **water pumps** in **Housing A and Housing B**.
- Upgrading lighting in classrooms on the **3rd and 4th floors of Engineering Building D** with **100 LED fixtures**.
- Upgrading lighting in classrooms on the **3rd and 4th floors of Engineering Building C** with **100 LED fixtures**.
- Upgrading all lighting in the **main restaurant of Housing Hotel E** with **50 LED fixtures**.
- Upgrading lighting in **4 classrooms of the Preparatory Studies Building** with **60 LED fixtures**.
- Upgrading **lighting, outlets, and accessories** on the **3rd and 4th floors of Housing Hotel C**.
- Upgrading **lighting, outlets, and accessories** on the **1st floor of Housing Hotel D**.
- Installing **7 control panels** for **7 irrigation system stations**.
- Installing **1 power factor correction panel** for the **Civil Machinery Lab in Engineering Building D**.
- Installing **1 power factor correction panel** for the **paper-cutting machine** in the Printing Building.

- Upgrading **outdoor lighting** at **Smart Cafeteria** with **6 façade LED lights (100 W)**.
- Upgrading lighting in the **ground-floor classroom** of **Engineering Building G** with **30 LED fixtures**.
- Upgrading **lighting, outlets, and accessories** on the **2nd and 3rd floors** of the **Industrial Modernization Building**.
- Upgrading **lighting, outlets, and accessories** in **Hall 02** of the **Preparatory Studies Building**.
- Installing **1 power factor correction panel** for a **UPS device** in **ground floor** of **Financial Affairs Building**.
- Upgrading **outdoor rooftop lighting** of **Eng. Faculty Buildings** with **6 façade LED lights (200 W)**.
- Upgrading **outdoor rooftop lighting** of the **Maintenance Building** with **6 façade LED lights (200 W)**.
- Upgrading **18 sub-distribution panels (power + lighting)** in the **Engineering Faculty Buildings**.
- Upgrading **6 sub-panels (power + lighting)** in **Housing Building D**.
- Upgrading the **main power and lighting panel** feeding the **restaurant** of **Housing Hotel D**.
- Upgrading **2 panels (power + lighting)** feeding the **Marine Safety Building vestibule**.
- Upgrading the **hangar power and lighting panel** of the **Technicians' Building**.
- Upgrading the **Maintenance Building's power and lighting panel**.
- Upgrading **all 2nd floor offices** of **Engineering Building A** (lighting + outlets + accessories).
- Upgrading **4 classrooms** on the **2nd, 3rd, and 4th floors** of the **Computers Faculty** (lighting + outlets + accessories).
- Upgrading **corridor lighting** throughout **Engineering Building G** with **300 LED fixtures**.
- Upgrading lighting in **4 classrooms** of **Engineering Building G** with **60 LED fixtures**.
- Upgrading lighting in **6 classrooms** of the **IMO Building** with **80 LED fixtures**.
- Installing **2 control panels** for **irrigation pumps** of the **main field and restaurant**, each **3 HP**.
- Upgrading **pool lighting** in the **Marine Safety Building** with **4 façade LED lights (200 W)**.
- Upgrading the **second phase of low-voltage panels** at the **main distribution station**.
- Upgrading **room lighting** in **Housing A and Housing B** with **180 LED fixtures**.
- Upgrading **bathroom lighting** in **Housing A and B** with **60 LED spotlights**.
- Installing a **service panel** at the **Engineering Faculty field** for temporary electrical connections during events.
- Upgrading **2 control panels** for the **water desalination plant** at the **main restaurant**.
- Upgrading the **fire alarm panel** in the **Admissions and Registration Building**.
- Installing a **power factor correction panel** for a **UPS** in the **ground floor** of the **Financial Affairs Building**.
- Installing an **alternating control panel** for **water pumps** in **Engineering Building G**.

Second: Miami Branch

- Upgrading **lighting on the ground floor** of the **main library and Building A classrooms** with **50 LED fixtures (40 W)**.
- Upgrading **rooftop lighting** of **Buildings A and C** to **LED** with **6 façade fixtures (200 W)**.
- Upgrading **6 administrative offices** on the **ground floor** of **Building A** (lighting + outlets + accessories).
- Upgrading **3 classrooms** on the **3rd floor** of the **Administrative Building** (lighting + outlets + accessories).
- Upgrading lighting in **4 classrooms** of **Building A** with **40 LED fixtures**.
- Upgrading **outdoor lighting** of the **Administrative Building and Building B** with **40 spotlights (6 W)**.
- Upgrading **landscape lighting** with **20 lighting poles**.
- Installing a **service panel** at the **International School playground** for event and occasion power connections.
- Upgrading **interior lighting** of the **new gym**.
- Installing a **separate power panel** for the **new gym**.

Third: Wabour El-Maya Branch

- Upgrading **corridor lighting on the ground floor** to LED with **50 fixtures**.
 - Installing **1 power factor correction panel** for a **UPS** in the **Studio**.
 - Upgrading **corridor lighting on the ground floor** to LED with **50 fixtures** (duplicate task confirmed).
 - Installing **1 control panel** for **2 water pumps (3 HP)**.
 - Upgrading lighting in **6 classrooms** with **50 fixtures**.
 - Upgrading lighting in **ground-floor corridors and 8 classrooms** with **50 spotlights (24 W)**.
 - Upgrading lighting in **classrooms and corridors on the 1st and 2nd floors** with **30 spotlights (24 W)**.
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Notes:

- The calculations are approximate and based on **8 working hours per day**.
- **Official holidays are not included** in these estimates.

➤ 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.

Since dependence on natural lighting is a main goal to reduce electrical load, a transparent glass roof is used. However, this would increase the indoor temperature and affect the AC conditioner efficiency. Thus, **motorized shading systems** -curtains that can be **opened or closed** based on **sunlight intensity, room temperature, or time of day** - are implemented for automatic adjustment for optimal cooling, thus enhancing AC energy efficiency as follows,

- During hot hours, they are **closed** to block solar radiation preventing rooms from heating up (Up to **30–40% reduction in unwanted heat gain**). Thus, AC works less while maintaining a comfortable temperature. When less heat enters the room, the AC runs for shorter cycles and at lower power, thus improving its cooling efficiency, extending its lifespan and reducing maintenance needs. This can **reduce AC energy use by 10–25%**.
- On cool days, they **open** to allow **natural light, ventilation** and reduce lighting and energy consumption.



(a)



(b)

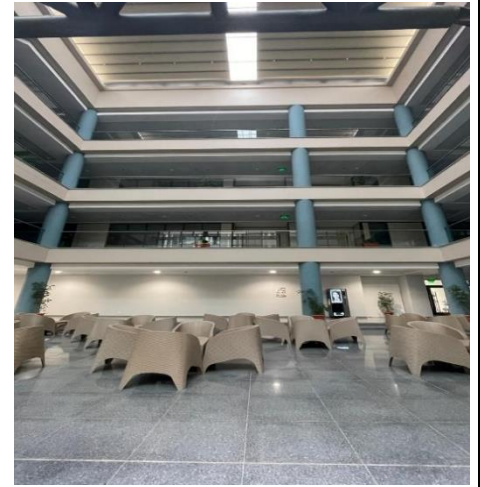


Fig. 2: Medicine Campus in AASTMT- El Alamein branch, (a) LED lights and lighting sensors, (b) All atriums have motorized shading systems

B. AASTMT Energy Consumption Insights

AASTMT Energy Research Unit and Energy Management Committee put forward several strategies for regular online monitoring of energy consumption in all AASTMT campuses. Insights of energy consumption were prepared by AASTMT Energy Sustainability Team and AASTMT Energy Management Committee based on the activities of the Maintenance and Electrical Facilities Department and Project Management in Abu Qir and the mechanism for follow-up and measurement of performance indicators (KPIs) as well as 2024 rationalization and renovation plans detailed in the previous subsection.

➤ Electrical Energy consumption in all Alexandria campuses

First, **energy consumption in all campuses of AASTMT Alexandria branch** is first analyzed since this branch experiences the highest consumption due to its multiple campuses and largest number of staff and students. **Figure3** 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.

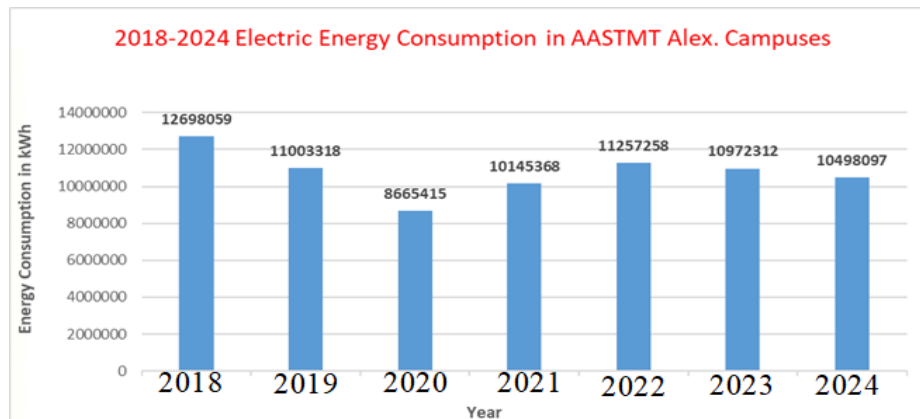


Figure 3. Total Electrical Energy consumption in kWh of AASTMT Alexandria campuses (2018-2024)

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, notable **energy savings** are achieved in electricity consumption in **2023** by **2.5%** resulting in energy consumption of **10,972,312 kWh** as shown in Fig. 4. Proceeding in the energy saving yearly procedure, 2024 witnessed energy consumption of 10,498,097 kWh with a further decrease of 4.32% from 2023.

These savings resulted from the renewal, upgrading, and control of the electrical systems in different campuses of AASTMT Alexandria branch as discussed in details in **2024 Energy conservation report**, resulting in total electricity savings in **2024 of 474,289 kWh** from 2023 as shown in **Table 1**. This verifies the effectiveness of AASTMT plan and measures towards energy efficiency and saving in its entire Alexandria campuses in 2024.

[2024 Energy Conservation Report](#)

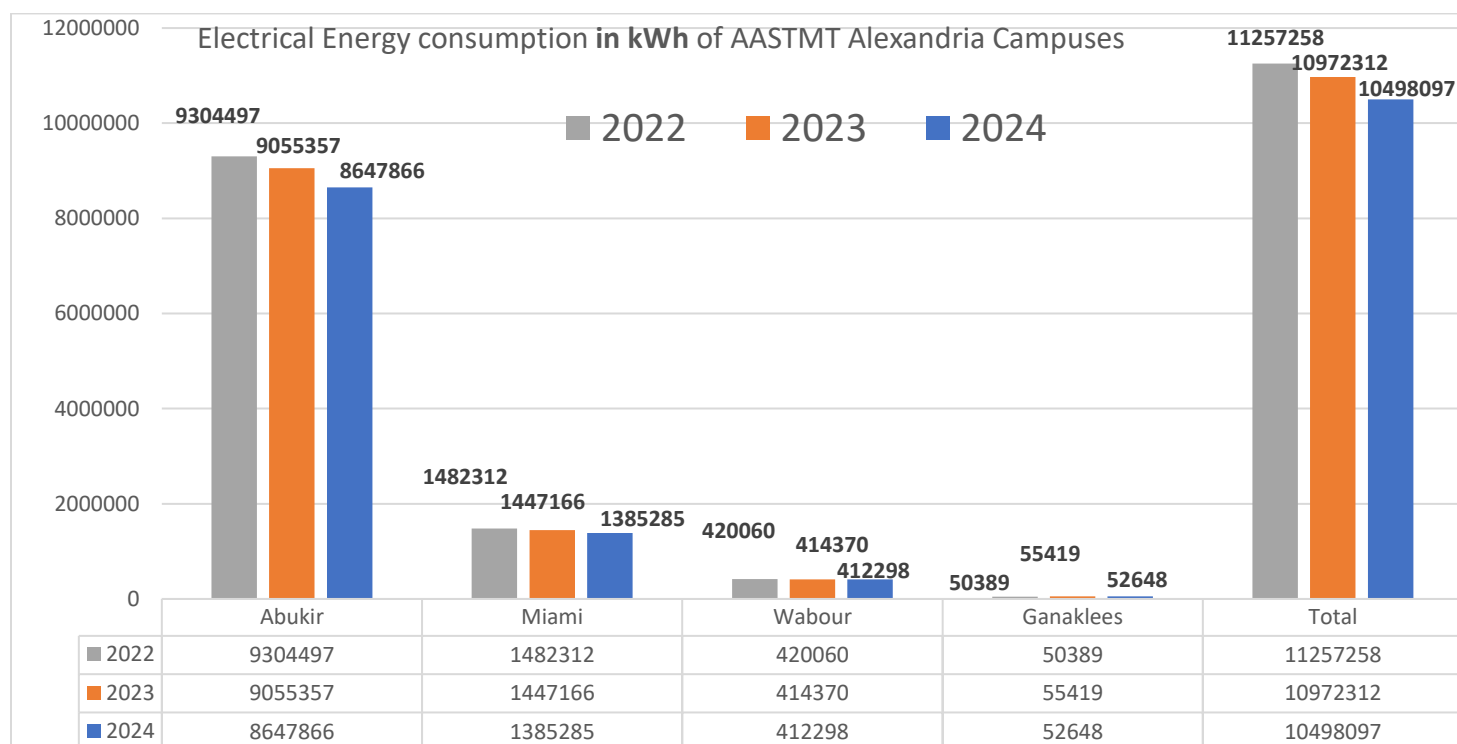


Figure 4. Electrical Energy consumption in kWh of AASTMT Alexandria campus (2022-2024)

Table1: Electrical Energy Savings in 2024 in AASTMT Alexandria Campuses

Year	Lighting (LED) Savings	Irrigation Savings	Air Conditioning Savings	Motors and Equipment Savings	Total Savings
2024	124,816 kWh	124,816 kWh	144,420 kWh	80,237 kWh	474,289 kWh

Summarizing insights of Alexandria campuses in 2023/2024

- Total energy used (2023) = 10972312 kWh=39500.32 GJ
- Total energy used (2024) = 10,498,097 kWh=37793.1492 GJ
- % reduction (2023/2024) = 4.32% reduction

➤ Energy consumption in all AAST branches all over Egypt

Regarding Energy consumption in all AAST branches all over Egypt (Alexandria, Aswan, Port-Said, Alamin, Sheraton, Smart village and Dokki), **Fig. 5** 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.

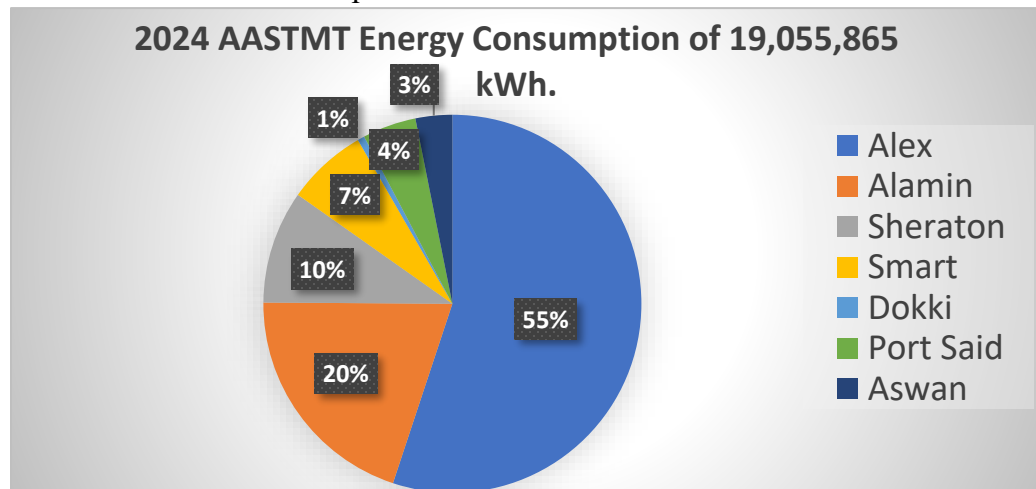


Figure 5. 2024 Energy Consumption in all AAST campuses in %

Comparing the energy consumption of all AAST campuses for the years 2023 and 2024, as illustrated in **Fig.6**, 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.**

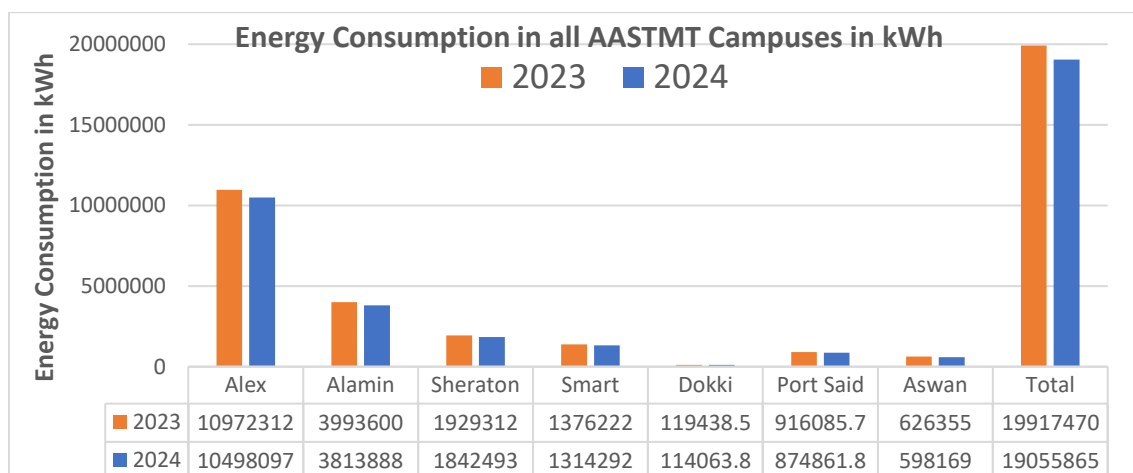


Figure 6. Comparison between 2023 and 2024 energy consumption in all AASTMT branches

2. Towards More Renewable Energy Employment

To support expansion in renewables employment within its campuses, AASTMT takes consistent measures that are continuously carried out, besides yearly updated ones. This is reflected in the increase of low-carbon sources' share in AASTMT total energy supply.

A. AASTMT Measures

Starting from 2022 along to 2024, AASTMT took consistent steps towards renewable energy (RE) sources employment, with a particular focus on solar power, by installing and functioning about **230 kW** solar of photovoltaic (PV) side and mounted stations as well as solar heaters as follows,

- In Aswan branch a **150kW grid tied PV power station** is mounted in the form of a roof mounted station and a side mounted one. Both work with net metering system.
- A grid-tied PV power station with a capacity of **50 kW** is installed in the Seventh Engineering Building in **Alexandria- Abukir campus** with net metering system.
- In 2022, **solar heaters** were installed in the **Pharmacy college- Alex. Abukir campus**, while others were planned to be installed to replace the electric heaters in **students' dorms – Alex. Abukir campus** and were put into action in **2024**.



(a)



(b)



(c)

Figure 7: Solar installation in AASTMT campuses (a) 150kW grid-tied roof and side mounted PV station in Aswan campus, (b) 50kW – grid tied PV station in Abukir Campus, (c) Solar Heaters in Abukir campus

However, to sustain and expand AASTMT efforts towards renewable energy solutions, regular measures are taken into account, besides initiatives and projects initiated annually to serve this goal.

i. Regular Measures

- **Continuous maintenance, routine cleaning and improvements** in the existing solar installations help to maintain and even improve their output power thus enhancing its energy share in all AASTMT consumption.
- **Investments in Energy-related LABs** intalled in AASTMT different campuses to guarantee continuous maintenance and improvements, thus assisting in consultancy, research and trainings. These Labs include;
 - **Energy Research Unit LAB in 7th Engineerring Building - Alexandria Headquarter**

Energy Research Unit LAB

- **Energy LAB in Eletrical Energy Engineering Department - Smart Village Campus**

Eletrical Energy Engineering LAB

- **Environmental Monitoring and Climate Change Laboratory - Scientific Research & Innovation Centre**

Environmental Monitoring and Climate Change Laboratory

ii. AASTMT 2024 Plan

Annually, AASTMT participates in renewable energy-related projects and improves the outcomes of already existing ones to serve the industry and community effectively and resourcefully. Besides, campaigns and technical talks are organized to increase the awareness about RE importance and technicality. Moreover, studies are conducted for renewables expansion in AASTMT infrastructure and facilities.

- Study the potential of **expanding renewable infrastructure** among different AASTMT campuses by installing new solar stations and other renewable solutions. See 2024/2025 proposal to establish a solar power plant and **two electric vehicle charging units** at the **College of Eng. and Technology building – Alamein**
[2024/2025 Study and Proposal for establishing PV station and EV charging units in Alamein Branch](#)

- Addition of **Renewable Energy Educational Lab** in the **Electrical and Control Eng. Dept- room G142 at AASTMT Alexandria - Abukir campus.**

It presents the essential need to prepare students with a comprehensive background in renewable energies via three experimental kits. These lab experiments help the students understand the main concepts regarding renewable energy, energy measurement and energy storage. The three main resources are Solar, Wind and Fuel Cell. The laboratory serves renewable energy courses and summer school camps.

[Renewable Energy Lab in EE Dept-AAST Abukir](#)

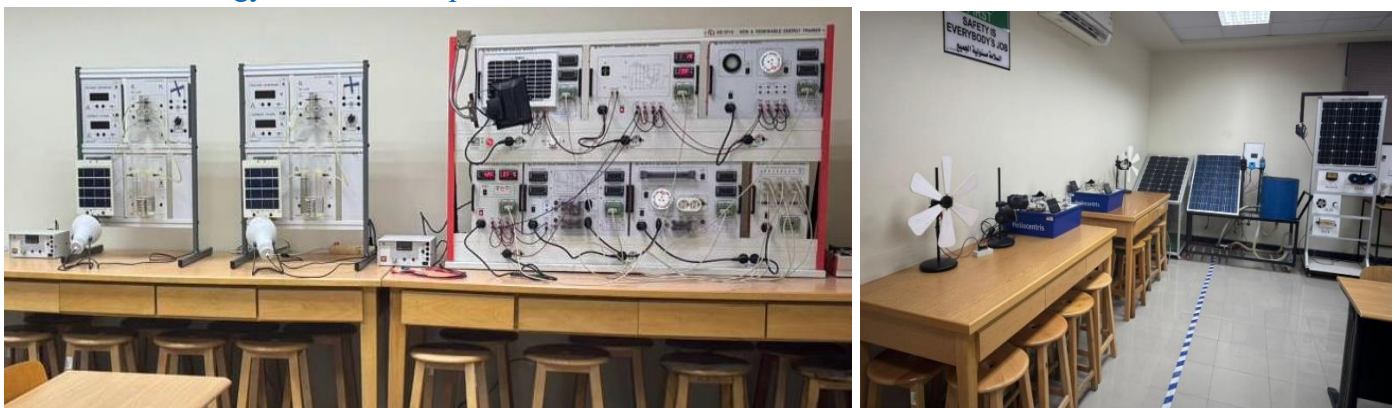


Fig. 8: Installed renewable energy educational lab in electrical and Control Eng. Dept. - Alex. Abukir campus

- Implement the outcomes of already existing **research projects** to serve the industry and community effectively and resourcefully via the implementation and testing of the unit designed in the research project: **Monitoring, Assessment and Innovative Treatment Technology to Enhance Groundwater Quality for Irrigation Purposes toward Climate Change Adaptation (TREATMENT) Funded Project**

The Renewable, Innovative and Integrated Water Treatment Unit designed in **2023** in the TREATMENT Project **was installed and put into action** in **2024**. This unit uses energy harnessed from **7kW photovoltaic system** to be used to lift water from a well, and subsequently, the water is directed through the four-stage nano-filter, where it undergoes a rigorous purification process. The end result is clean, potable water or water suitable for irrigation and cultivation and almost 7kW PV system, serves as the sustainable energy source for the three-phase pump.

[Project News](#)

[TREATMENT Project](#)

[Water Treatment Unit Report-May2024](#)



(a)



(b)

Fig. 9: TREATMENT Project Implementation (a) Solar PV Mounting Structure, (b) Realized Water treatment unit

- Encourage **renewable energy-related events and activities** (campaigns, initiatives, seminars, workshops, visits and trainings).

[Renewable Energy-related Events](#)

[Renewable Energy-related Activities](#)

- Prioritize **renewable energy research projects and graduation projects**.

[Renewable Energy Research Projects](#)

[Renewable Energy Graduation Projects](#)

- Prioritize **renewable energy projects in AASTMT Industry Service Complex** to serve the industry and community effectively and resourcefully.

[AAST ISC 2024/2025 projects](#)

Renewable Energy-related 2024/2025 Projects in AASTMT Industry Service Complex include,

➤ Smart Solar Waste Compactor

“Smart Solar Waste Compactor,” aims to develop an intelligent device for compacting plastic waste in various institutions such as schools, hospitals, and factories, relying primarily only on **solar energy** as its main power source. This project represents a **practical solution** that helps **reduce plastic pollution**, promotes the **concept of a circular economy**, and encourages institutions to **sort their waste** and **gain financial returns** from it.

[Smart Solar Waste Compactor](#)

➤ Solar Agricultural Robot

This is an integrated agricultural robot powered by **solar energy** and considered the second of its kind in the region. The robot was developed through joint funding from AASTMT and businessman Eng. Ahmed Abu Hashima in the project, named “**LiDAR Navigation IoT Solar Agribot**”. This project aims to **support smart clean and sustainable farming** and **reduce reliance on manual labor**, particularly in desert and muddy environments.

[Solar Agricultural Robot](#)

➤ Liquid Tree

An environmental photobioreactor, powered by **solar energy**, is implemented to purify the air and produce oxygen using marine algae. The project is a **low-cost version** of a model used in the UAE, which costs around **\$10,000**, while the students managed to build the unit in **Egypt for less than 15,000 EGP**. The **amount of oxygen** produced by this system is **equivalent to that of ten mature trees**, making it suitable for use in **parks, schools, and crowded urban areas**.

[The Liquid Tree](#)



(a)



(b)



(c)

Fig. 10: 2024 renewable energy-related projects in AASTMT Industry Service Complex
(a) Smart Solar Waste Compactor, (b) Solar Agricultural Robot, (c) Liquid Tree

B. AASTMT Renewables Insights

AAST consumption is supplied mainly from the Egyptian national grid in which the renewable energy (RE) share has increased from **6.3GW in 2022** to **6.7Gw in 2023** till reaching **8.6GW in 2024** as per **NREA Report 2024**, achieving an increase by almost **6.3% from 2022 to 2023 and by 28.4% from 2023 till 2024** as shown in **Fig.11**. Besides renewable energy contributed in AASTMT from national grid, there is almost **230 kW solar energy installations** on AASTMT campuses buildings, with production reaching almost **75989 kWh in 2024**. The latter shows an increase of almost **1.3% from the 75000 kWh solar installations in 2023** as shown in **Fig. 11**. This reflects AASTMT efforts to divert to clean energy, energy efficiency, reduce emissions and sustain serving the Environment. Conclusively, AASTMT average **renewable energy share in supplying its total energy demand** (including RE share in national grid and its solar installations) reached **above 25% in 2024** which is more than the **24% in 2023**, reflecting AAST continuous efforts and investments to increase its RES installations, meeting its roadmap of achieving 25% RES share by 2025 and progressing towards its long-term goal of 40% RES share by 2040.

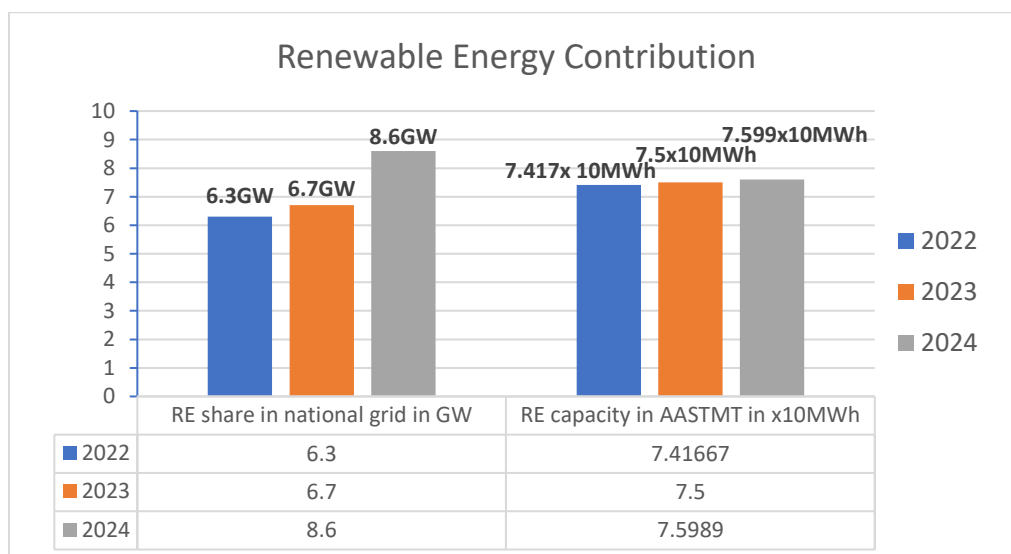


Figure 11. Renewable energy share in national grid [NREA Report 2024] and AAST RE installations

Regarding **AASTMT 2024 energy density**, **Table 2** shows energy consumption analysis for all **AAST campuses allover Egypt** and gives the **energy density in kWh/m²**.

Table 2. Analysis of Energy for all AAST campuses in 2024

	Alex	Alamin	Sheraton	Smart	Dokki	Port Said	Aswan	Total
Floor Area (m ²)	392402.5137	208000	45000	32000	1750	42000	14500	735569.7
Consumption (kWh)	10,498,097	3,813,888	1,842,493	1,314,292	114,064	874,862	598,169	19,055,865
Energy Density (kWh/m ²)	26.75	18.336	40.944	41.07	65.179	20.83	41.253	25.91

Table 3 shows the entire AAST energy density, including energy from national grid and from AASTMT total solar installations, in kWh/m² and GJ/m² in 2024 compared to that of 2023. The calculated energy density reached about **0.09363GJ/m² in 2024** which is less than the **0.09785GJ/m² 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 AAST support to transition to clean energy.

Table 3. Energy Density in GJ/m² 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

3. Towards Less Carbon Emissions

To support decarbonization within its campuses, AASTMT takes consistent measures that are continuously carried out, besides yearly updated measures which are reflected in carbon emissions reduction among its campus.

A. AASTMT Measures

Measures taken by AASTMT in 2024 to contribute to emissions reduction are discussed in details in **AASTMT 2024 Climate Action Plan** as well as **AASTMT Carbon Emissions Reduction and Sustainability Progress Report (2024)**.

[AASTMT Climate Action Plan 2024](#)

[AASTMT Carbon Emissions Reduction and Sustainability Progress Report \(2024\)](#)

These measures can be summarized as;

i. Regular Measures

- Conduct **regular assessments of carbon emissions** to implement strategies for reduction.
- Proceeding with the comprehensive **recycling program** implemented across all campuses, targeting paper, plastic, and electronic waste
- Consistent and expanded use of **digital platforms** to reduce paper consumption.

ii. AASTMT 2024 Plan

- Different Scopes of emissions are tackled in 2024 as follows,

Scope 1 (Direct). Scope 1 covers emissions from university-controlled sources, principally refrigerant leakage from HVAC/refrigeration systems and fuel use in university-controlled equipment/vehicles. Thus, in **2024**,

Scope 1 is to be reduced by applying **tighter refrigerant management and continued operational efficiency measures**.

Scope 2 (Purchased electricity). Scope 2 accounts for emissions from grid electricity used by AASTMT. AASTMT efforts focus on operational optimization and energy efficiency upgrades—when ~95% of conventional lighting had been replaced with **LED** and **smart building management systems (BMS)** had been deployed across major buildings. In 2024, teams prioritized **BMS tuning** (scheduling, set-points, and alarms), targeting **HVAC**, and **light controls** in high-use spaces, besides **on-site solar output to lower grid dependence**

Scope 3 (Selected categories). Scope 3 remains the largest share and includes waste, water, paper, and transmission & distribution (T&D) losses associated with purchased electricity. In 2024, AASTMT plans to implement **measurable waste minimization targets and standardized protocols for sorting and collection** across campuses, including: (i) expanding labeled collection points in high-traffic areas, (ii) reinforcing operating procedures with facilities teams, and (iii) running term-start refreshers for staff and students.

- Promote **behavioral change** among staff and students to reduce energy consumption, foster awareness, and encourage sustainable practices via **initiatives, campaigns and workshops**.

[Energy-related Events](#)

[Energy-related Activities](#)

- Engage postgraduate students and faculty in **conducting studies on climate adaptation, carbon footprint and decarbonization in AASTMT campuses**, especially the largest AASTMT Alex. campus
As per the latter, a study was conducted in 2024 and published in 2025 as shown in the link below.
<https://www.sciencedirect.com/science/article/pii/S0973082625001334>

This study proposed a roadmap toward total AASTMT - Alex campus sustainability through four dedicated energy and emissions management strategies-solar rooftop PV installation, electric bus conversion, smart building technology deployment, and biodiesel production from waste cooking oils. These measures theoretically reduce the carbon emissions of CMTT campus by 696.76 tCO₂e per year, along with an annual cost-saving of about 87,500 dollars when implemented jointly. Each strategy was studied qualitatively and quantitatively, and the strengths were discovered to differ in regard to emissions effects, financial return, and convenience of implementation. The solar PV system creates a perfect impact on emissions, besides the financial argument, while smart building retrofits are quickly paid back. Biodiesel production has a small contribution, but has added value of closing the resource loop while demonstrating for educational purposes.

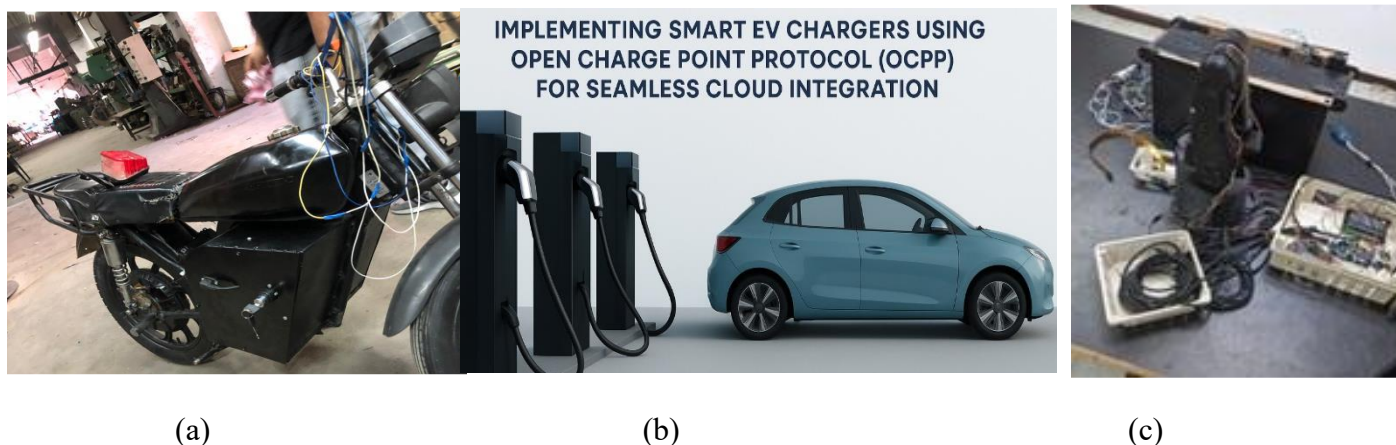
- Prioritizing fields of decarbonization and clean energy in 2024/2025 **research and graduation projects**,
As per this measure, examples of 2024/2025 graduation projects that serve decarbonization are shown below,
 - **Convert an internal combustion engine (ICE) motorcycle to electric**
By replacing the engine with a hub motor and battery system, the motorcycle will achieve benefits of e-bike (low carbon footprint and low oil dependency). This project won a fund from Academy of Scientific Research and Technology (ASRT)-Egypt.

➤ **Implementing Smart EV Chargers using OCPP for seamless cloud integration**

The Open Charge Point Protocol (OCPP) is a key standard enabling seamless communication between EV charging stations and networks. It supports remote monitoring, firmware updates, and real-time energy optimization, ensuring reliable charging for drivers. By fostering interoperability, OCPP drives scalable, future-proof EV infrastructure, integrating smarter grids and renewables for widespread EV adoption.

➤ **AI- Powered Recyclable Materials Sorting System**

This is an intelligent recycling system that automates the sorting of recyclable materials to enhance operational efficiency, reduce labor costs, and enhance recycling efficiency, thus promoting more efficient waste management procedures and more sustainable decarbonization practices, addressing key environmental and public health concerns.



(a)

(b)

(c)

Figure 12: Examples of 2024 Decarbonization projects,

(a) Converted motorcycle, (b) Smart EV chargers, (c) Recyclable materials sorting system

B. AASTMT Carbon Emissions Insights

As per Carbon Emissions, calculations were made to evaluate **carbon emissions (kg CO²-e) in Alexandria campus** for the years **2018 to 2024** as discussed in details in **2024 AASTMT Carbon Emissions Report**.
[AASTMT Carbon Emissions 2024](#)

Table 4: AASTMT-Alexandria campus- Carbon Emissions from 2018 to 2024 (kg CO²-e)

Year	Scope 1 (kg CO ² -e)	Scope 2 (kg CO ² -e)	Scope 3 (kg CO ² -e)	Total Emissions (kg CO ² -e)
2018	1,244,230.50	1,240,286.52	98,997,739.78	101,482,256.80
2019	1,374,252.42	1,151,281.20	152,068,847.38	154,594,380.99
2020	972,551.04	869,471.36	87,130,328.87	88,972,351.27
2021	1,561,942.92	1,008,256.20	112,858,633.63	115,428,832.75
2022	1,300,000.00	950,000.00	110,000,000.00	112,250,000.00
2023	1,150,000.00	925,000.00	105,000,000.00	107,075,000.00
2024	1,092,500	897,250	101,873,000	103,862,750.00

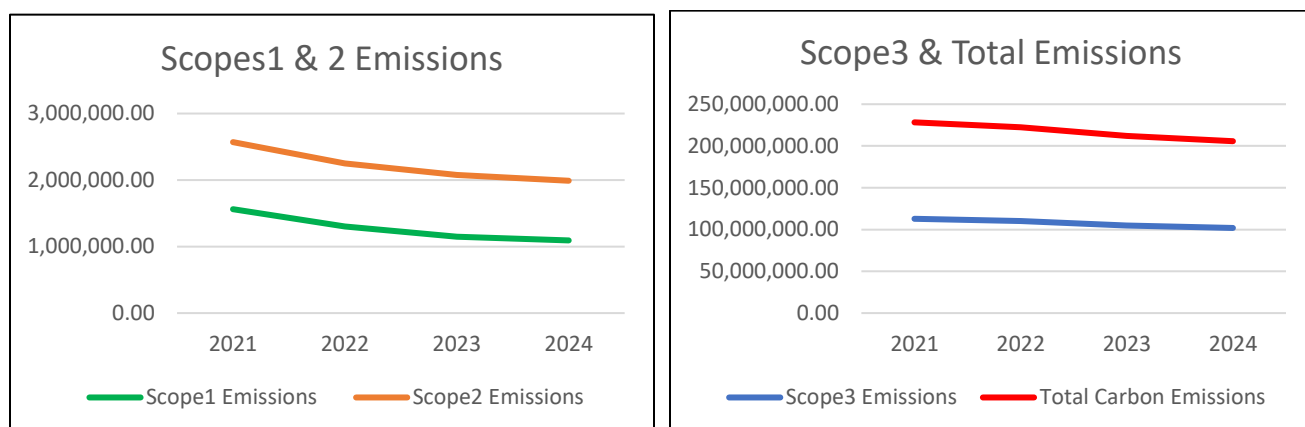


Figure 13: Zooming into AASTMT-Alexandria campus- Carbon Emissions (kg CO₂-e) within 2021- 2024

Table 4 presents the emissions across **Scope 1, Scope 2, and Scope 3**, as well as **total carbon emissions**, within the period 2018-2024, while **Fig. 13** zooms into emissions insights within 2021-2024. Using the Greenhouse Gas Protocol's framework, insights are provided into direct and indirect emissions, to identify key areas for improvement. **Scope 1 emissions**, which encompass direct emissions from university-controlled sources, include fuel usage for the campus transport fleet and emissions from refrigerant leaks in air conditioning and refrigeration systems. On the other hand, **Scope 2 emissions** arise from indirect emissions due to purchased electricity, while **Scope 3 emissions** account for indirect emissions from activities as waste disposal, water usage, and paper consumption.

Analyzing these **emissions insights**, it is concluded that by **year-end 2024**, AASTMT's total carbon footprint is **103,862,750 kg CO₂e**, a further **–3.0%** from **2023's 107,075,000 kg CO₂e**. Against the **2019** base year (**154,594,380.99 kg CO₂e**), this equates to a **–32.8%** reduction—keeping AASTMT comfortably on track to maintain the **≥30% reduction by 2025** required by the Climate Action Plan and aligned with the longer-term **–50% by 2040** goal.

Reductions were achieved across **Scope 1, Scope 2, and Scope 3**, driven by **improved refrigerant management, energy-efficiency upgrades** (including the 2023 LED/BMS program), **incremental on-site solar generation**, and **continued waste and paper minimization**. Consistent with the published series, Scope 3 remains the dominant share while showing gradual improvement due to resource-efficiency measures and procurement practices as discussed in details in **2024 AASTMT Carbon Emissions Report**.

[2024 AASTMT Carbon Emissions Progress Report](#)

5. Conclusion

In 2024, AASTMT continues its progress towards energy sustainability and carbon emissions reduction based on insights of 2024. By the end of 2024, the university has achieved the following:

- Energy consumption reduction in 2024 by almost 4.3% from 2023 and total 17.33% from 2018
- Total carbon emissions reduction in 2024 by 3% from 2023 and total of 32.8% from 2019.
- Increasing the RES share of AASTMT energy demand to over 25% in 2024.

These achievements were driven by key measures taken by AASTMT in 2023/2024, including continuous infrastructure renovations to adopt energy-efficient technologies, increase of renewable energy sources' share, besides improvements in waste management and recycling programs as well as related initiatives and awareness campaigns.

All this reflects AASTMT progress **Towards Efficient, Clean and Renewable AASTMT**, keeping in track with its short-term goal and progressing towards its long-term sustainability goals, as follows;

- **Short-term Goal by 2025:** AASTMT has already succeeded to exceed the 2025 goal of achieving 30% carbon reduction compared to 2019 and depending on 25% renewable energy in its supply.
- **Long-term Goal by 2040:** By 2040, AASTMT aims to achieve a 50% reduction in carbon emissions compared to 2019 levels and increase its reliance on renewables in its energy supply to almost 40%. Analyzing AASTMT progress in this context through the years 2022, 2023 and 2024, AASTMT has proved determination and capacity to meet its ambitious energy and carbon related long- term goals.