



AA Type III multi-manufacturing and repacking facility in the Philippines, operating under a global partnership, sought to optimize its energy and water consumption. Despite having initiated energy conservation efforts in 2020, the facility observed a steady increase in electrical consumption over a five-year period, reaching a peak baseline of over 6.1 million kWh annually by 2024. To comply with Republic Act No. 11285 (Energy Efficiency and Conservation Act), the organization required a comprehensive ASHRAE Level 2 Energy Audit to identify inefficiencies and establish a technical roadmap for sustainability.

The Challenge

- The objective was to perform a detailed survey of the facility's energy-consuming systems. The goal was to identify and evaluate Energy Conservation Measures (ECMs)—ranging from no-cost behavioral changes to high-cost technical retrofits—and provide a financial analysis including implementation costs, projected savings, and simple payback periods.

ENERGY AUDIT REPORT LEVEL 2

Electricity Consumption						
Electricity Consumption in kWh/year						
Month	2019	2020	2021	2022	2023	2024
Jan	260,180	266,315	284,730	275,640	426,295	472,925
Feb	291,800	296,165	309,480	430,450	478,625	495,520
Mar	259,548	293,910	281,970	437,495	439,300	493,910
Apr	288,168	308,040	319,950	448,770	515,100	527,425
May	303,078	327,420	330,300	461,905	518,250	521,090
Jun	303,525	351,030	326,670	476,200	502,250	489,328
Jul	297,756	312,840	308,430	452,870	494,050	494,050
Aug	316,806	310,020	320,010	459,055	531,205	528,365
Sep	304,204	309,930	328,230	486,925	519,760	507,615
Oct	290,103	292,380	314,760	468,875	500,125	522,525
Nov	287,733	291,510	340,740	481,300	523,045	549,035
Dec	275,555	278,400	322,260	452,005	493,465	538,115
TOTAL	3,478,456	3,637,960	3,787,530	5,331,490	5,941,470	6,139,903

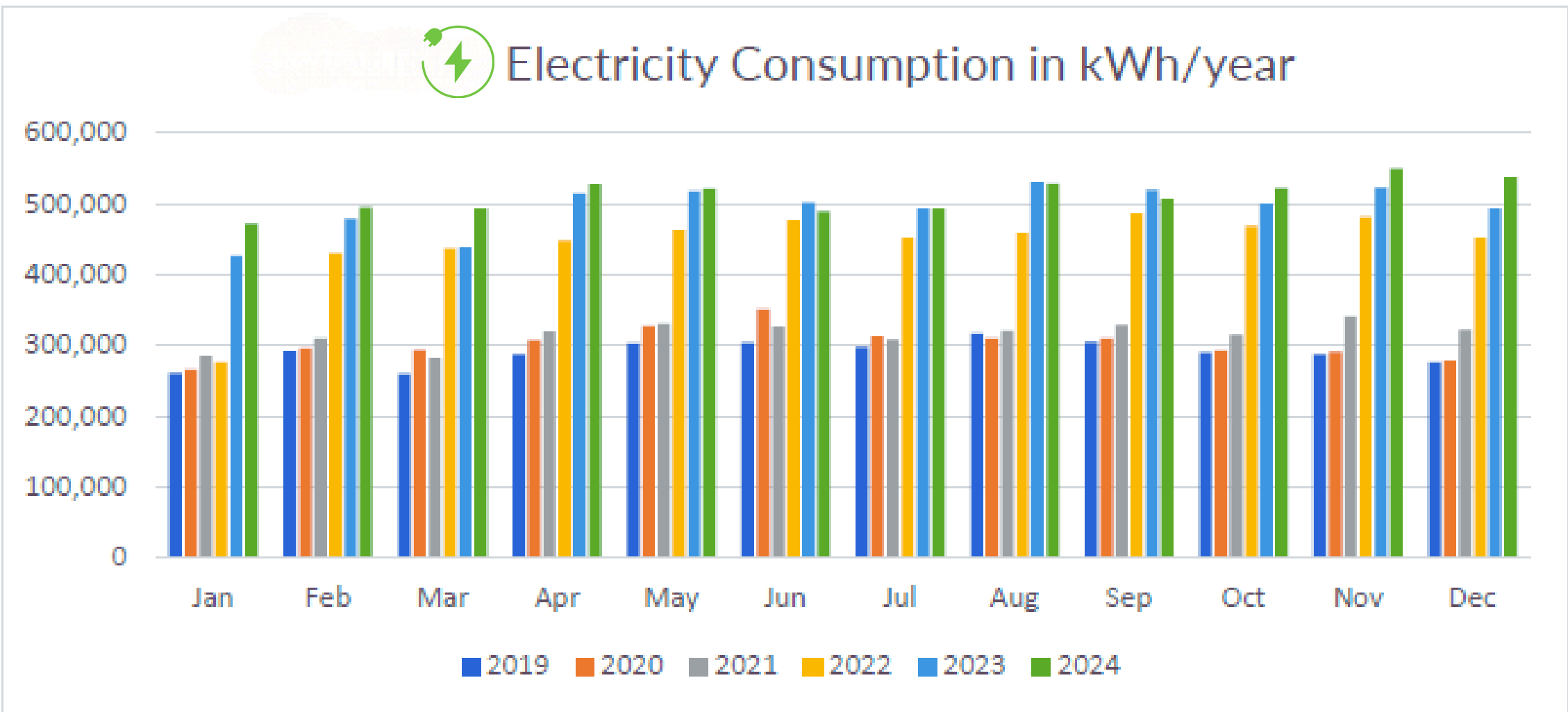


Fig. 1. As shown above, electrical consumption data for the past five years. The lowest consumption was in 2019 with 3,478,456 kWh/year, and the highest was in 2024 with 6,139,903 kWh/year. The 2024 figure will serve as the baseline for the Energy Utilization Index (EUI).

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ENERGY AUDIT REPORT LEVEL 2

Diesel Oil Consumption (kWh)

Consumption in kWh/year				
Month	2021	2022	2023	2024
Jan	2,440	7,236	1,220	0
Feb	0	5,628	610	7,320
Mar	0	804	610	0
Apr	1,280	4,480	0	3,184
May	0	3,050	610	4,612
Jun	1,920	640	2,440	0
Jul	4,480	0	3,810	0
Aug	1,280	0	0	4,270
Sep	0	5,552	0	0
Oct	1,280	3,050	3,660	0
Nov	0	0	1,220	0
Dec	9,330	832	0	0
TOTAL	22,010	31,272	14,180	19,386

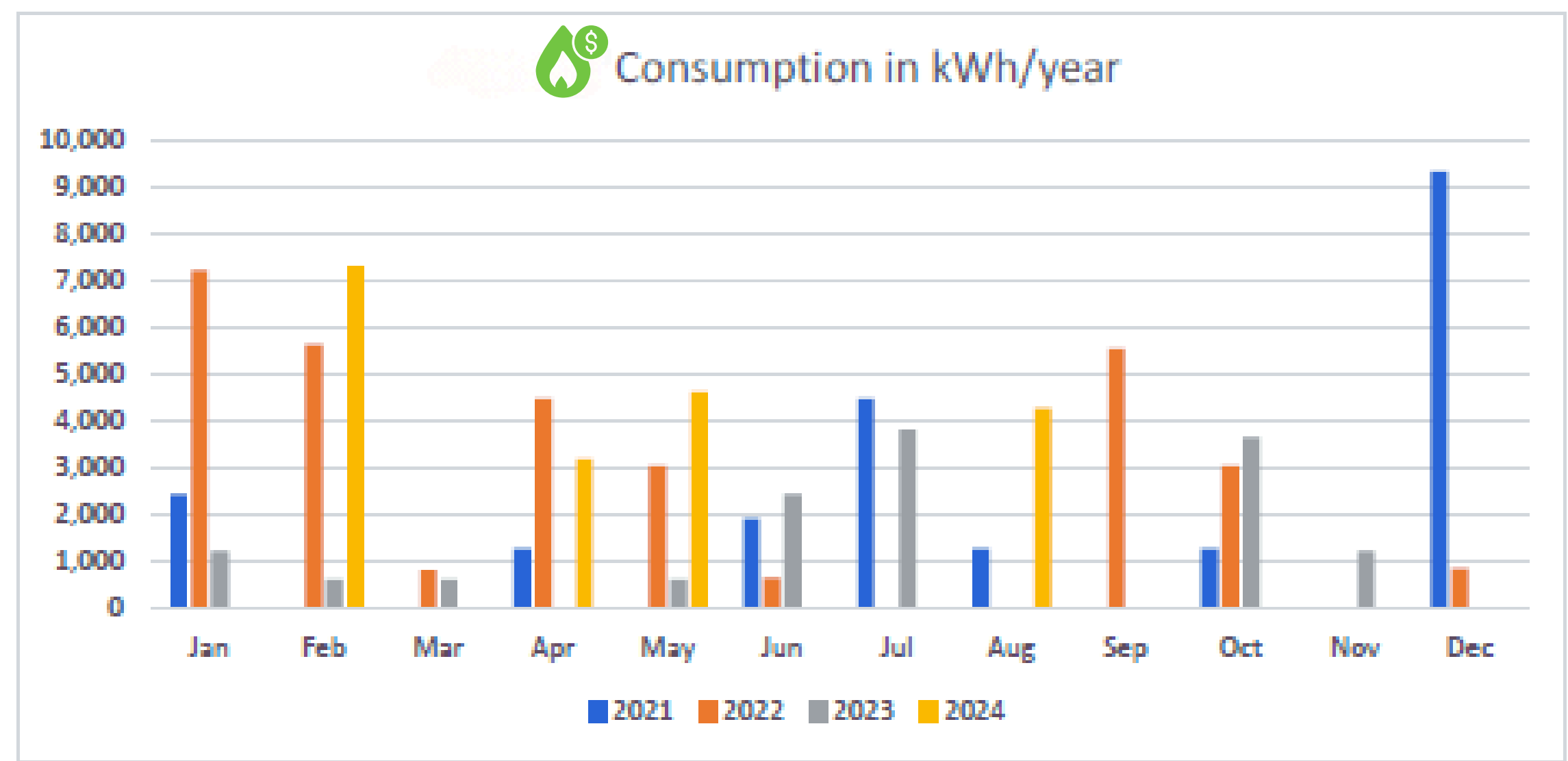


Fig. 2. The data on generator set consumption for the last four years are shown above. The lowest consumption is in the year 2024 with 19,386 kWh/year while the highest is in the year 2022 with 31,272 kWh/year. Generator is only used if there is a production shutdown or emergency power failure.



ENERGY AUDIT REPORT LEVEL 2

Water Consumption in m³

Water Consumption in m ³				
Month	2021	2022	2023	2024
Jan	891	1,104	1,095	888
Feb	1,050	988	1,222	1,161
Mar	1,053	862	887	940
Apr	1,176	757	731	1,092
May	972	755	1,088	975
Jun	1,002	942	1,181	1,109
Jul	904	849	1,185	1,065
Aug	847	785	1,294	1,331
Sep	980	916	1,179	998
Oct	933	653	1,110	865
Nov	1,248	881	1,260	1,062
Dec	1,037	1,096	1,037	902
Total m ³	12,093	10,588	13,269	12,388

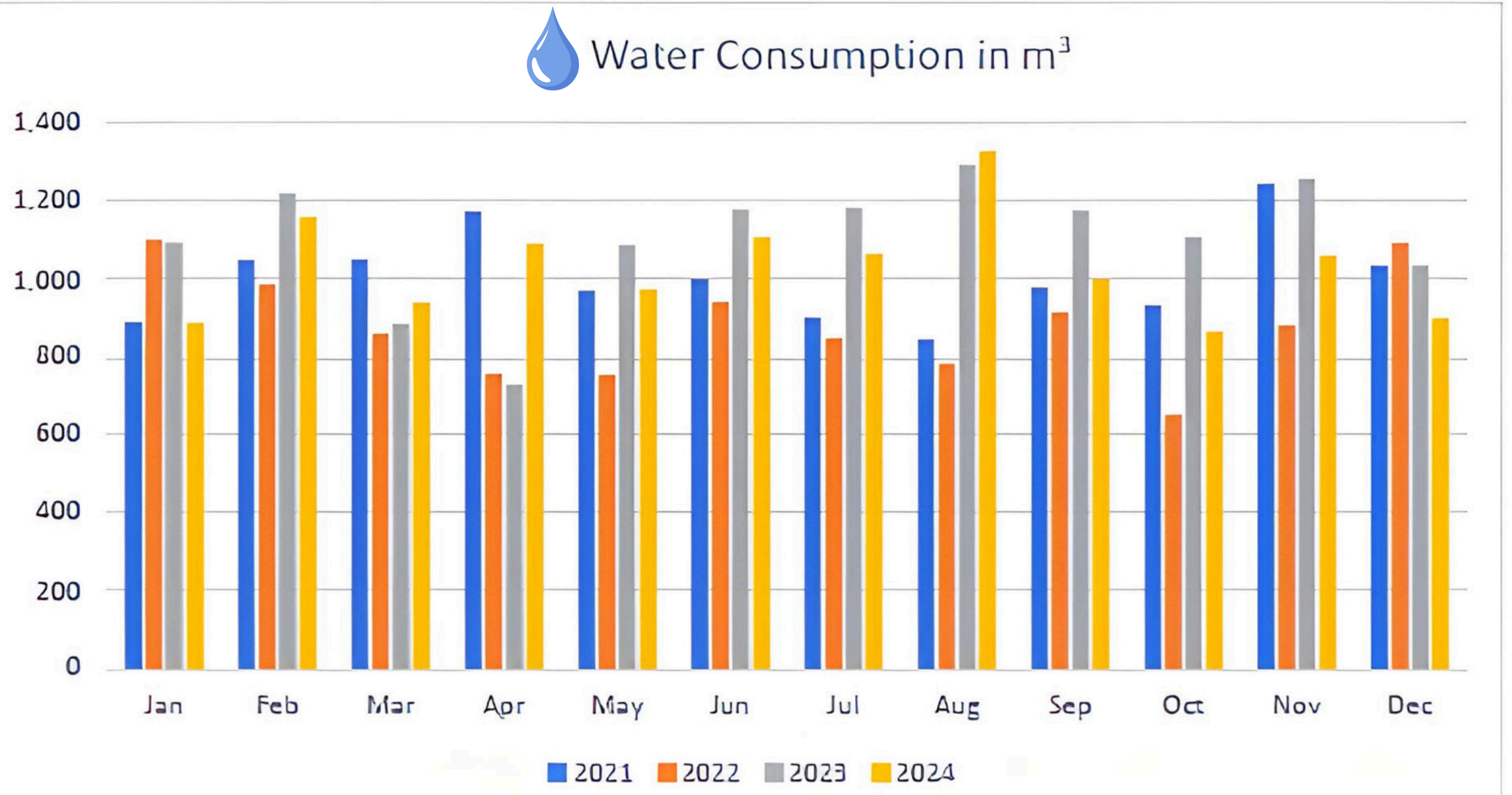


Fig. 3. the data on water consumption for the last four years are shown above. The lowest consumption is in the year 2022 with 10,588 m³/year while the highest is in the year 2024 with 13,269 m³/year.

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✓ The Solution

The audit team conducted a multi-day on-site walkthrough and technical assessment focusing on:

- ✓  **Operational Review:** Analyzed five years of utility data (electricity, diesel, and water) to establish an **Energy Utilization Index (EUI)**.
- ✓  **Technical Assessment:** Evaluated the building envelope, lighting systems, cooling systems, and plug loads.
- ✓  **Engineering Analysis:** Applied the Affinity Laws to calculate potential savings for motor-driven systems.
- ✓  **Strategy Development:** Categorized recommendations into three tiers:
 - **Low-Cost:** Upgrading outdated non-inverter ACUs to modern inverter types to utilize variable motor speed control.
 - **High-Cost:** Retrofitting air compressors with Variable Frequency Drives (VFDs) to steady discharge pressure and installing Static Var Generators for power quality optimization.
 - **Renewable/Structural:** Integration of Solar Tube technology to maximize natural daylighting in production areas.



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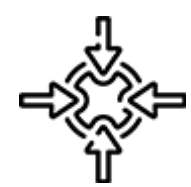


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The Impact

The audit provided a clear financial and technical pathway to significantly reduce the facility's carbon footprint and operational expenditure.



Business & Financial Results

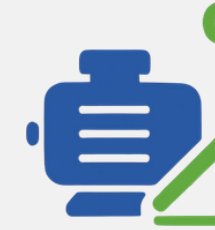
-  **Total Annual Cost Savings:** Projected an annual reduction in utility overhead of approximately 20% compared to the 2024 baseline.
-  **Investment Efficiency:** Developed a capital expenditure plan with a combined portfolio Simple Payback Period of ~3.8 years.
-  **ROI by Measure: * ACU Upgrades:** ~2.8-year payback.
 -  **Air Compressor VFD Retrofit:** ~2.6-year payback.
 -  **Static Var Generator:** ~2.9-year payback.
-  **Regulatory Compliance:** Successfully transitioned the facility into full alignment with DOE Level 2 Audit requirements, mitigating legal risks and enhancing the brand's sustainability profile.

Table 1: Summary of Recommended Energy Conservation Measures (ECM)

ECM	Project	Initial Cost (₱)	Energy Savings kWh	Cost per kWh (₱)	Total Cost Savings (₱)	Simple Payback (years)
1	ACU Inverter Upgrade	₱ 91,990.00	4,530	₱ 7.20	₱ 32,616.00	2.82
2	Air Compressor VFD Retrofit	₱ 711,968.00	38,064	₱ 7.20	₱ 274,060.80	2.60
3	Solar Tube Installation	₱ 1,660,000.00	18,396	₱ 7.20	₱ 13,451.20	12.5
4	Static Var Generator Installation	₱ 2,400,000.00	115,340	₱ 7.20	₱ 830,449.00	2.89
	Total	₱ 4,863,958.00	176,330	₱ 7.20	₱ 1,269,576.00	3.83



Technical Results

-  **Energy Consumption Reduction:** Identified a total annual electricity saving of over **175,000 kWh**.
-  **System Optimization:** Calculated that replacing fixed-speed motors with inverter technology would reduce specific ACU energy consumption by approximately 40% per unit.
-  **Efficiency Benchmarking:** Established a baseline Energy Usage Intensity of **~141 kWh per production unit**, providing a metric for all future efficiency tracking.
-  **Lighting Performance:** Projected a 30% to 50% reduction in lighting-related costs through the implementation of automated control systems and daylighting.

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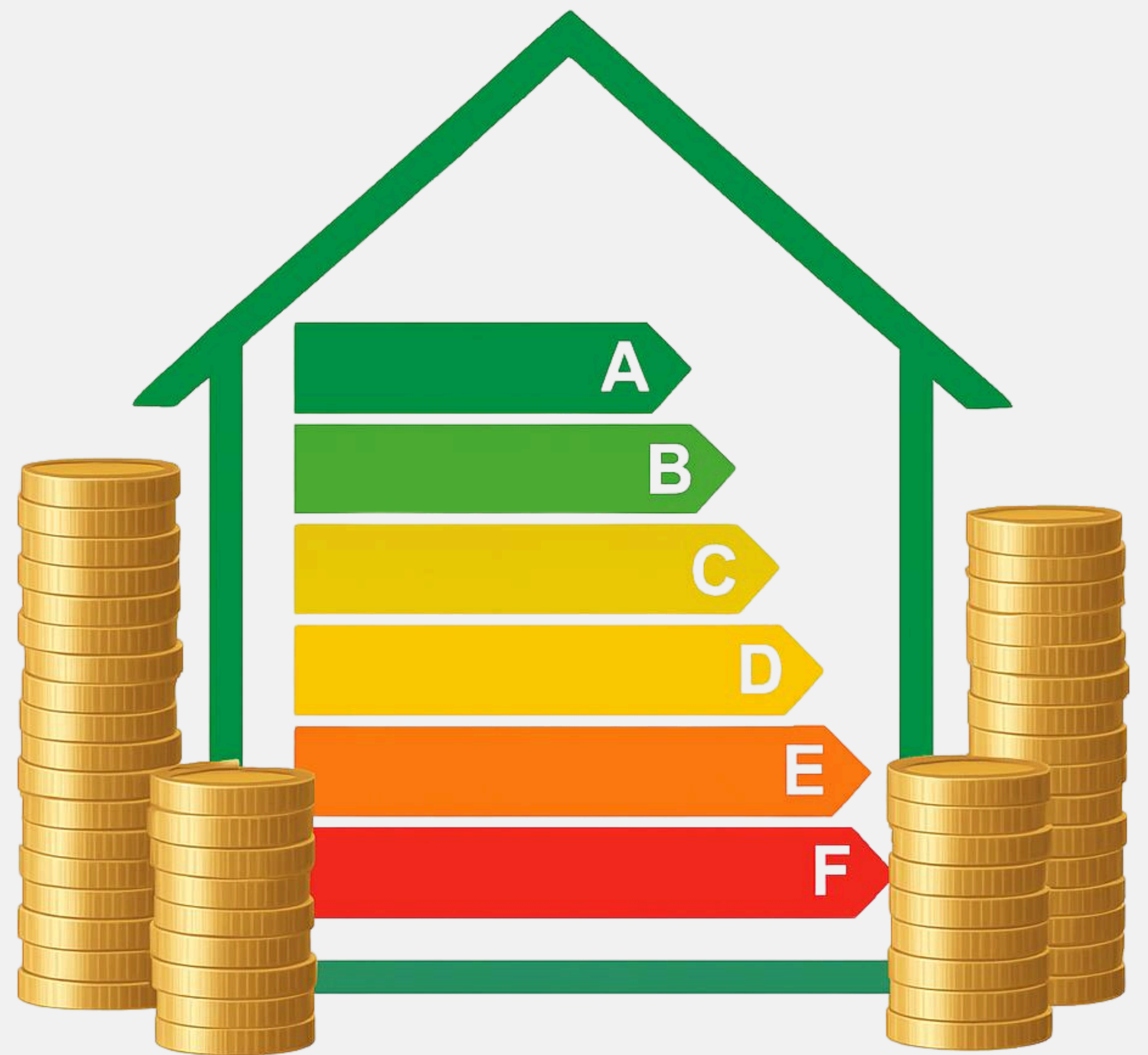
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Conclusion

In summary, the Level 2 Energy Audit conducted for the facility established a critical energy baseline of 6,159,289 kWh for the 2024 calendar year, identifying significant opportunities for both technical and operational optimization. By implementing a strategic mix of no-cost behavioral changes, low-cost inverter upgrades, and high-cost retrofits—including VFD installations and Static Var Generators—the facility is projected to achieve an annual electricity saving of over 176,000 kWh. These measures represent a total annual cost reduction of approximately ₱1.27 million, offering a commercially viable weighted payback period of 3.83 years. Beyond the immediate financial gains, these interventions ensure full compliance with Republic Act No. 11285, reinforcing the organization's commitment to sustainable manufacturing and long-term energy resilience.



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