ENERGY AUDIT REPORT

M/s. CHEMBUR COMPREHENSIVE COLLEGE.

CHEMBUR, MUMBAI.

Submitted By,

M/s. TECHNOCRATS
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Mumbai-400 089.

Date of Visit: 6th February, 2024.

PRIVATE AND CONFIDENTIAL

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ACKNOWLEDGEMENT

We express our sincere thanks to the management of Chembur Comprehensive College, Chembur for their co-operation without which the Energy Audit could not have been possible. The courtesy and cordiality extended to the audit team is highly appreciated.

-TECHNOCRATS TEAM

1.0 Brief about the Assignment:

Chembur Comprehensive College, Chembur, Mumbai had requested for carrying out Energy Audit of their building. Accordingly, Shri. Suhas S Neglur, Certified Energy Auditor carried out energy audit at site on 06/02/2024.

The data for energy audit was collected by:

1) Conducting a simple Walk-Through audit or observation of the energy consumption of electrical appliances within the college building.
2) Review and analyse energy usage history to create a baseline for which savings can be measured in the audited building.

2.0 Summary of Recommendations:

Below are recommendations based on general observations carried out throughout the building. The recommendations are categorized with A being the most urgent where immediate actions are needed to be executed (first or second week of receiving the report). B can be 1 or 2 months after receiving this report, while C will depend upon availability of funds.

Table 1:

Recommendations

Category A	Category B	Category C
Service the air conditioner units quarterly.	Replace existing old conventional tube lights with LED Tube lights.	Replace old existing air conditioner units with efficient ones.
	Carry out testing of solar panels to assess their working status. Install separate meter to record units generated by solar panel.	Arrange to update Single Line Diagram of Electrical Distribution Network along with required stencilling.

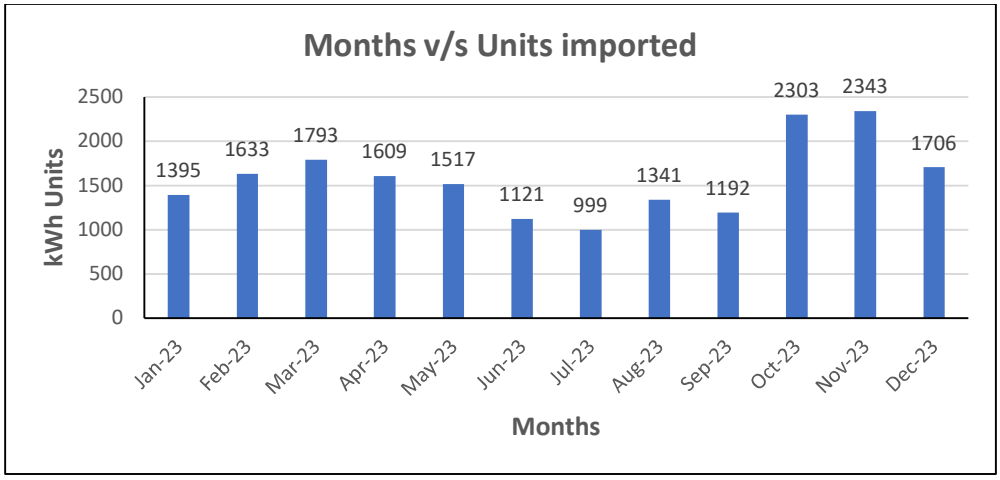
3.0 Existing Electrical System:

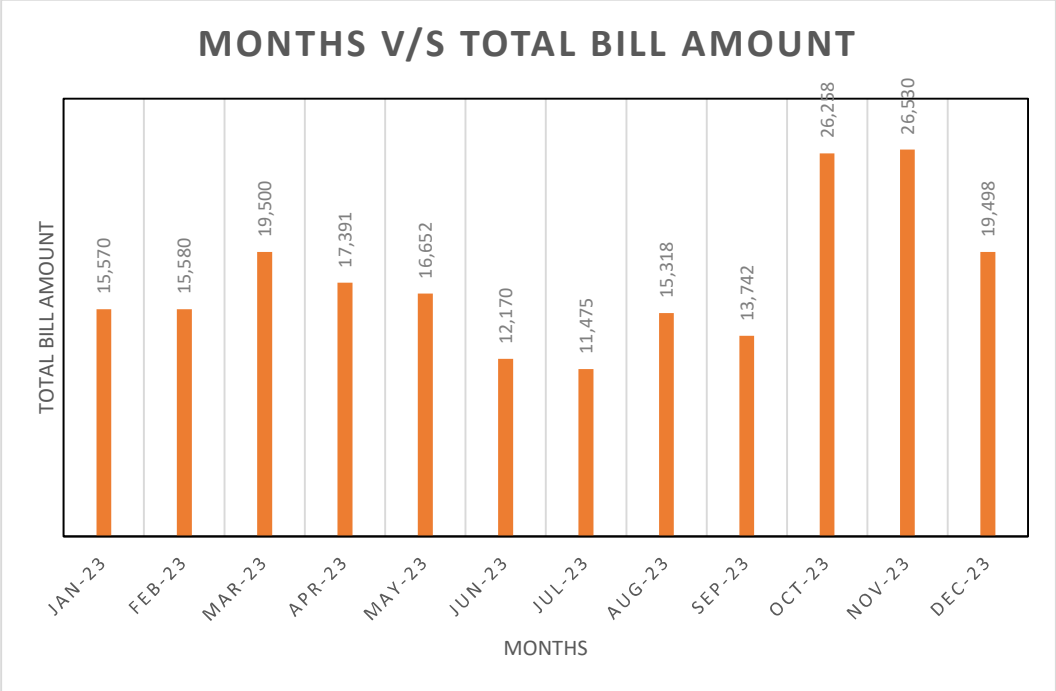
Chembur Comprehensive College is a LT Consumer of M/s Adani Electricity Ltd. The consumer is fed by a LT Cable. Solar panel of 15 kWp is also installed in the premises. The main load of the premises is lighting load of tube lights and fans. Few Air conditioners are also installed in offices and staff room. Bidirectional Energy meter no. 9059208 is installed by utility M/s. Adani Electricity Ltd. for measuring the total units imported by the consumer and total units exported by the consumer. Consumer is billed on the difference of the imported and exported units.

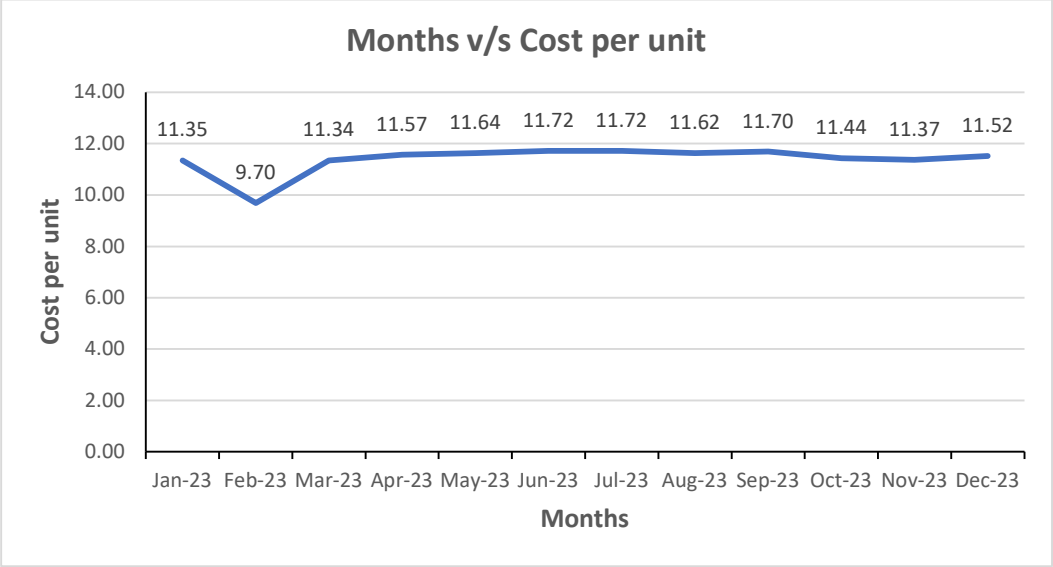
4.0: Electricity Consumption and Bills:

The college is getting its power supply from M/s Adani Electricity ltd. The tariff structure offered is LT – IV (B). The college has also installed Grid connected Rooftop Solar PV Plant of 15 KWp. The average monthly electricity bill paid by the college is **Rs.17,474/-** and the average monthly kWh consumption is 1539 units. The average monthly Rs/unit is 11.39/-**.** For details of the electricity bill please refer **Table – 1.**

Months	kWh Units			Total Bill Amount	Rs./Unit
	Imported	Exported	Billed		
Jan-23	1395	23	1372	15,570	11.35
Feb-23	1633	26	1607	15,580	9.70
Mar-23	1793	74	1719	19,500	11.34
Apr-23	1609	106	1503	17,391	11.57
May-23	1517	86	1431	16,652	11.64
Jun-23	1121	83	1038	12,170	11.72
Jul-23	999	20	979	11,475	11.72
Aug-23	1341	23	1318	15,318	11.62
Sep-23	1192	17	1175	13,742	11.70
Oct-23	2303	7	2296	26,258	11.44
Nov-23	2343	10	2333	26,530	11.37
Dec-23	1706	14	1692	19,498	11.52
Avg.	1579	41	1539	17,474	11.39
Max	2343	106	2333	26,530	11.72
Min	999	7	979	11,475	9.70







5.0 Observations and Recommendations:

5.1 Solar Power Generation:

a) Background:

Solar energy is radiant light and heat from the Sun that is harnessed using a range of technologies to generate electricity, solar thermal energy (including solar water heating) and solar architecture. It is an essential source of renewable energy. Its technologies are broadly characterized

as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaic systems, concentrated solar power, and solar water heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favourable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air. Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV) or indirectly using concentrated solar power. Photovoltaic cells convert light into an electric current using the photovoltaic effect. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight to a hot spot, often to drive a steam turbine.

Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications. Commercial concentrated solar power plants were first developed in the 1980s. Since then, as the cost of solar electricity has fallen, grid-connected solar PV systems have grown more or less exponentially. The array of a photovoltaic system, or PV system, produces direct current (DC) power, which fluctuates with the sunlight's intensity. This DC Power is usually converted to alternating current (AC), through the use of inverters. Multiple solar cells are connected inside panels. Panels are wired together to form arrays, then tied to an inverter, which produces power at the desired voltage.

b) Observations:

1) At the premises, one 10 kWp 3 phase solar power generating system and one 5 kWp single phase solar generating system are installed in December 2016.

2) No separate meter seems to be installed for recording units generated by the solar power plant. Only exported units are mentioned in the electric bills. On scrutiny of the bills for the period January 2023 to December 2023 the kWh units exported varies from 7 units to 106 units.

3) Lot of dust was found accumulated on the solar panels installed on the terrace of the building.

4) On an average, the 10 kWp 3 phase solar panel generates 30 to 40 units per day (900 to 1200 units per month) and the 5 kWp solar panel generates 20 units per day (600 units per month). Hence the units generated by the two solar panels should be sufficient to cater the load of the college. However, from the bills it is seen that on an average 1579 units are being imported.

c) Recommendation:

1) It is recommended to install calibrated energy meter to accurately measure the units generated by both the solar panels.

2) It is recommended to carry out testing of solar panels through AMC vendor to verify if all the panels are working properly.

5.2 Lighting:

a) Observations:

It is observed that the main load of the college is the lighting load which includes tube lights and ceiling fans. There are 149 tube lights, 29 bulbs and 109 fans installed in the premises. There are 5 a/c and 42 computers installed in the premises.

It was also observed that about 60% of the tube lights are old conventional type which consume more energy. Due to use of combination of conventional and LED tubes, the lux level in some major areas is also less than standards specified.

b) Recommendation:

1) It is recommended to replace existing 93 nos. conventional tube lights by 20W LED tube lights to achieve savings in bill and improvement in lux level. Cost benefit analysis is given in **Appendix A**.

Appendix A:

Cost benefit analysis of replacement of old conventional tube lights by LED tube lights

No. of 40W old conventional tube lights = 93

Units consumed by 93 tube lights per day considering 8 hrs working/day = 30 units

Units consumed by 93 tube lights per month considering 22 working days = 660 units

Wattage of replaced tube lights = 20 W

No. of 20W new LED tube lights replaced = 93

Units consumed by 93 tube lights per day considering 8 hrs working/day = 15 units

Units consumed by 93 tube lights per month considering 22 working days = 330 units

Saving in units consumed per month by replacement of tube lights = 330 units

Saving in energy charges per month = Rs. 2,178/-

Cost of one LED tube = Rs.350/-

Cost for 93 LED tubes = Rs. 32,550/-

Payback period = 15 months