ENERGY AUDIT REPORT
FOR
SWAMI SHRADDHANAND COLLEGE

Elion Technologies & Consulting Private Limited

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Acknowledgement

Elion Technologies and Consulting Pvt Ltd places on record it's thanks to Swami Shraddhanand College for entrusting the task of conducting energy audit study.

We acknowledge with gratitude the whole hearted support and cooperation extended by all team members while carrying out the study.

Site Information

Name of College	Swami Shraddhanand College
College Address	Swami Shraddhanand College, University of Delhi, Alipur, Delhi, 110036
Execution Partner	Elion Technologies & Consulting Pvt Ltd
Communication Address	307, 3rd Floor DDA Lal Market H-Block Vikas Puri, New Delhi-110018
Date of Audit	20th June 2023
Year of Audit	2022 – 2023
Main Energy Consuming Machines/Equipments considered for Energy Audit	• Lighting & Fans • Air Conditioners • Motors & Pumps • Desktops & Printers

Executive Summary

Swami Shraddhanand College, a constituent College of Delhi University, is run under the trusteeship of Delhi Govt. It is a co-educational institution and imparts instructions in various subjects at both undergraduate and post-graduate levels. Situated in the sylvan ambience of North Delhi, the College has completed 56 years of its existence. From the humble beginning in the Gandhi Ashram building in Narela, the college is now one of the premier institutions of Delhi University. It is equipped with qualified teaching staff, specialized laboratories and adequate library facilities. It is an autonomous body.

The college has extensive playgrounds, which provide an excellent opportunity for budding sportsmen and athletes to participate in various games and sports and to improve their skills and capabilities. Scholarships and freeships are given to deserving students. Every year a number of prizes are awarded to students on their meritorious achievements in academic and extra-curricular activities.

The students' societies / associations play a vital role in improving the academic environs of the college. For each subject, there is a society to stimulate the interests of the students in the subject and establish its interlinking with the society at large. The societies/associations sponsor lectures, seminars, exhibitions etc., and undertake programmes and activities to make the subject more interesting and more relevant for societal need.

List of courses offered by the institute:

- B.Sc. (H) Botany
- B.Sc. (H) Zoology
- B.Sc. (H) Physics
- B.Sc. (H) Chemistry
- B.Sc. (H) Microbiology
- B.A. (H) English
- B.A. (H) Hindi
- B.A. (H) Geography
- B.A. (H) History
- B.Com. (H)
- B.Com. (P)
- B.Sc. (P) Physical Science
- B.Sc. (P) Life Science
- B.Sc. (P) Agrochemical and Pest Control
- B.A (P)

Electricity is supplied by Tata Power Delhi Distribution Limited and a solar power plant of capacity 50KW is present in the college.

The energy audit included detailed data collection, analysis of data and identification of specific energy saving proposals.

Chapter 01: Introduction

Swami Shraddhanand College evinced interest in availing the services of Elion Technologies and Consulting Pvt Ltd for conducting energy audit of their premises.

Elion Technologies and Consulting Pvt Ltd team conducted the Detailed Energy audit on 20th June 2023.

This report is on the energy audit carried out Swami Shraddhanand College. The detailed energy audit comprised of the following activities:

- Data collection of power consuming equipment's.
- A brief session on energy management was conducted to seek more inputs from the personnel engaged in operation and maintenance of electro mechanical services.
- Analysis of collected data.
- Discussion with the officials on the identified proposals.
- Discussion and reporting of the findings of energy audit with the management staff.

All the identified energy savings proposals have been discussed with the executives concerned before finalizing the projects.

The contents of the report are based solely on the data provided by Swami Shraddhanand College officials during the energy audit.

The management should implement the suggestions made in the report after verifying requisite safety aspects.

Methodology for Energy Audit:

The following is a list of general procedure and information undertaken during the energy audit:

- General information of the site.
- Baseline energy description.
- Past energy consumption bills which include electricity bills.

- On site data collection
- Energy analysis of different sectors.
- Recommendation of energy conservation measures.

The primary goal of the energy audit was to identify sources and areas of potential energy savings and cost saving throughout the Plant by measures of optimization, replacement, retrofitting, and on the other hand, to also provide recommendations on operational and maintenance practices improvements.

Chapter 02: Energy Consumption Details

List of equipment's presents in the campus:

Rating of Transformer (in KVA)	350KVA
Year of installation of the Transformer	-
Rating of DG Set (in KVA)	125KVA
Rating of Capacitor Bank (if present)	-
Capacity of Solar Power Plant (if installed)	50KW

The main areas of energy consumption as observed during the audit are as follows:

- Air Conditioners
- Lighting & Fans
- Desktops & Printers

The main sources of energy to meet the required consumptions are as follows:

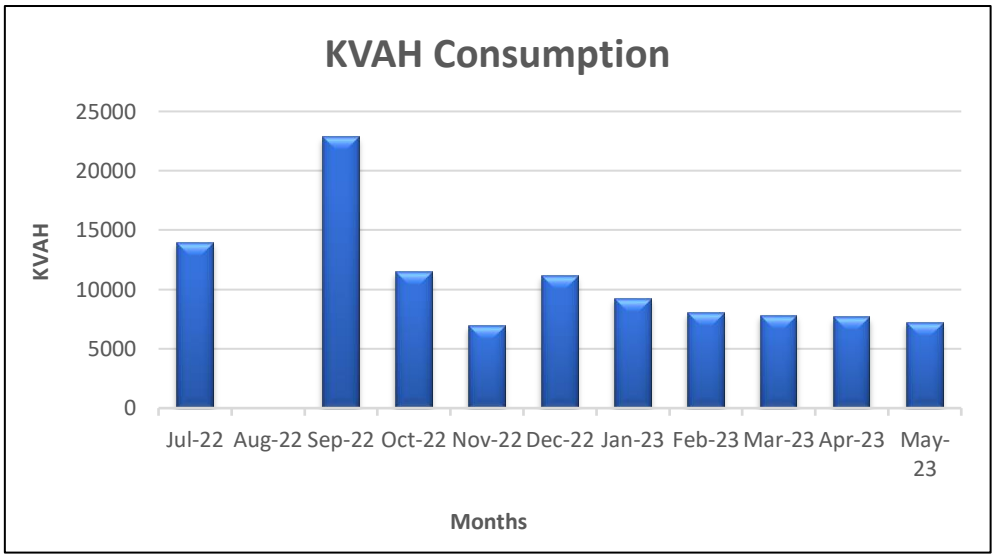
- Electricity supply from Power Distribution Company.
- Solar Power Plant of capacity 50KW.

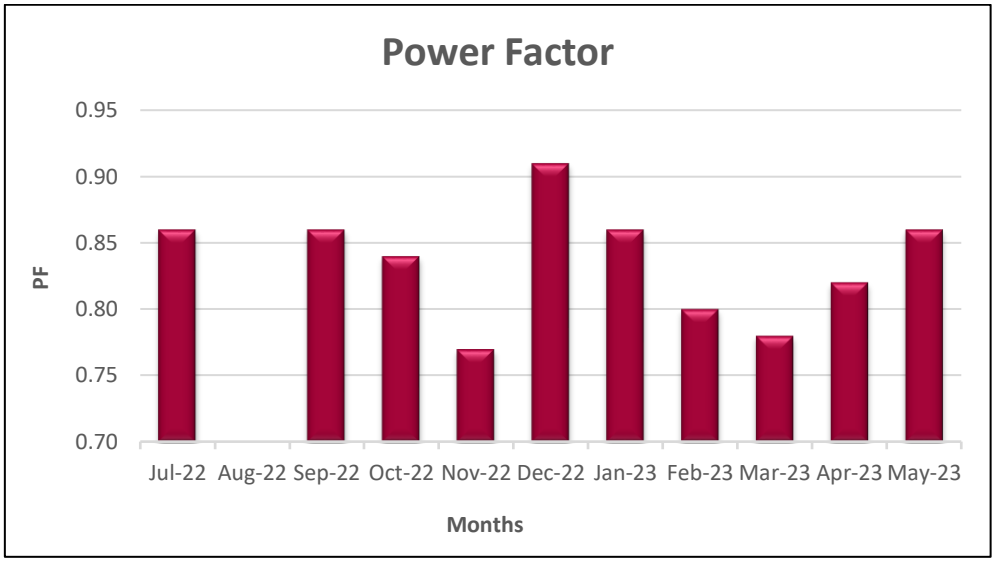
Consumption pattern for energy is given below:

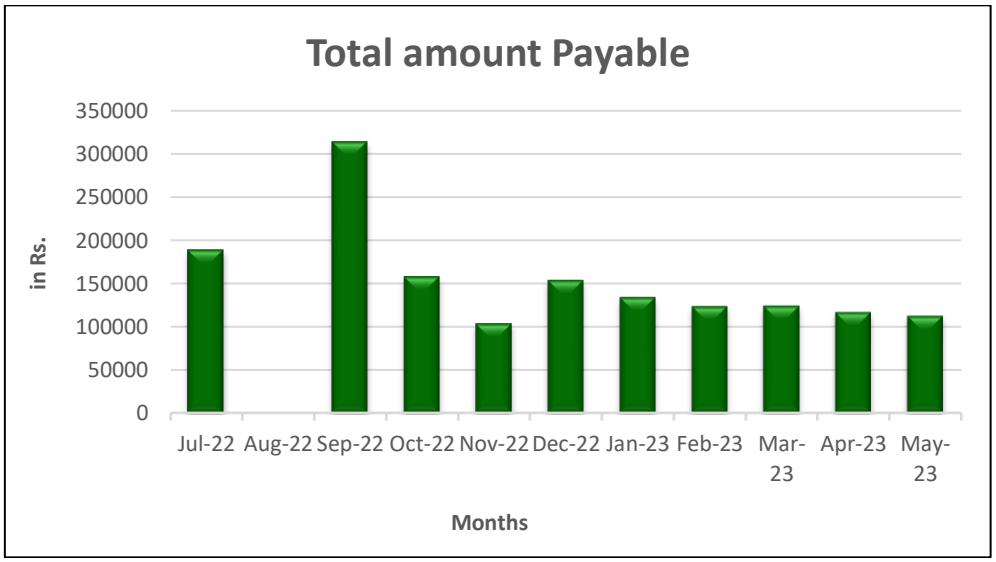
Available electricity bills for the past year were collected and following is the summary. Some of the electricity bills for the period are missing.

CA No: 60006159861 – OLD BUILDING					
Months	KWH Consumption	KVAH Consumption	MDI (KVA)	Power Factor	Total amount Payable
Jul-22	11962	13918	50.24	0.86	188591
Sep-22	19414	22831	51.36	0.86	313800
Oct-22	9571	11452	48.92	0.84	158160
Nov-22	5364	6966	35.92	0.77	103820
Dec-22	10158	11159	38.64	0.91	153750
Jan-23	7972	9253	45.16	0.86	133830
Feb-23	6461	8053	22.52	0.80	123070
Mar-23	6102	7821	26.6	0.78	123740
Apr-23	6293	7667	31.16	0.82	116540
May-23	6246	7236	45.36	0.86	112160

Average Net KVAH Consumption	10635.6
Average Power Factor	0.84
Average cost of electricity per month (Rs.)	152746.1



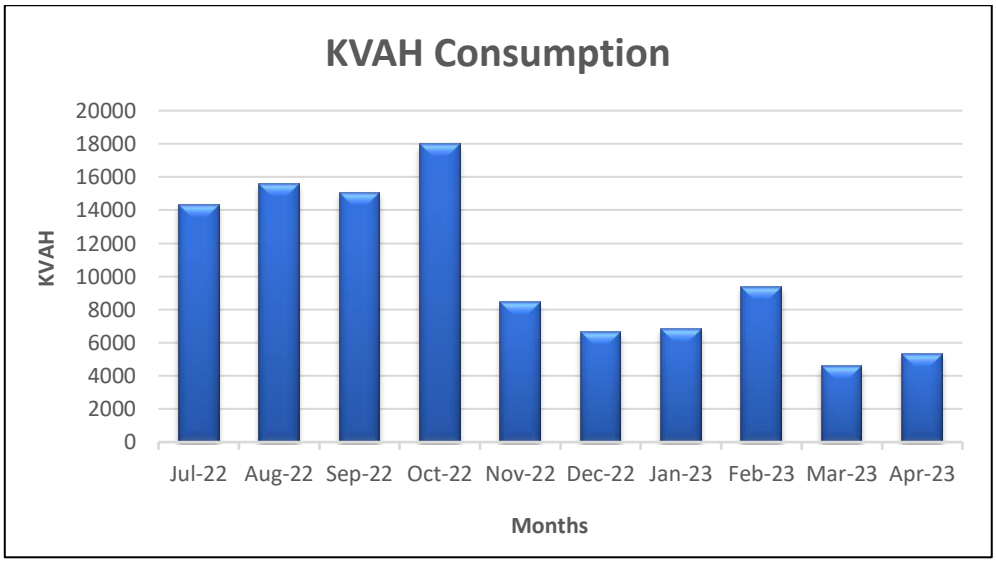


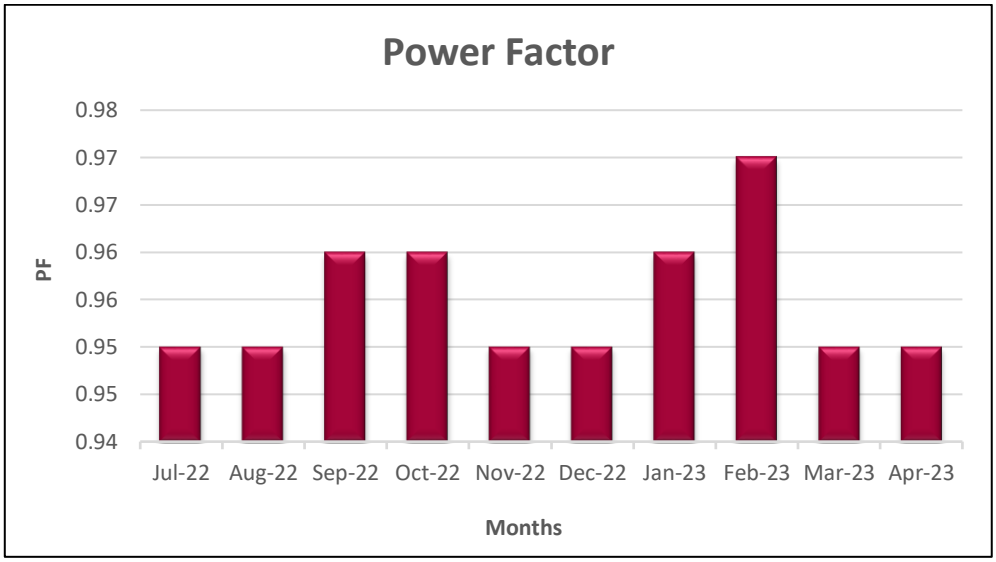


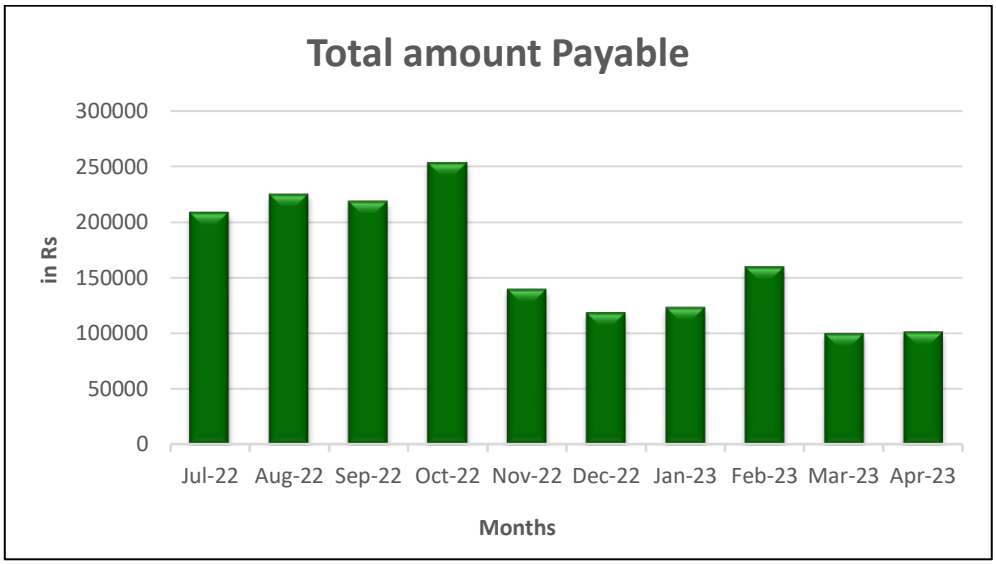
CA No: 60007761947 – NEW BUILDING			
Months	KVAH Consumption	Power Factor	Total amount Payable
Jul-22	14316	0.95	208740
Aug-22	15593	0.95	224990
Sep-22	15047	0.96	218780
Oct-22	17974	0.96	253760
Nov-22	8450	0.95	139930
Dec-22	6666	0.95	118600

Jan-23	6840	0.96	123270
Feb-23	9382	0.97	159690
Mar-23	4606	0.95	99870
Apr-23	5334	0.95	101130
May-23	9454	0.96	161440

Average Net KVAH Consumption	10333
Average Power Factor	0.96
Average cost of electricity per month (Rs.)	164563.63

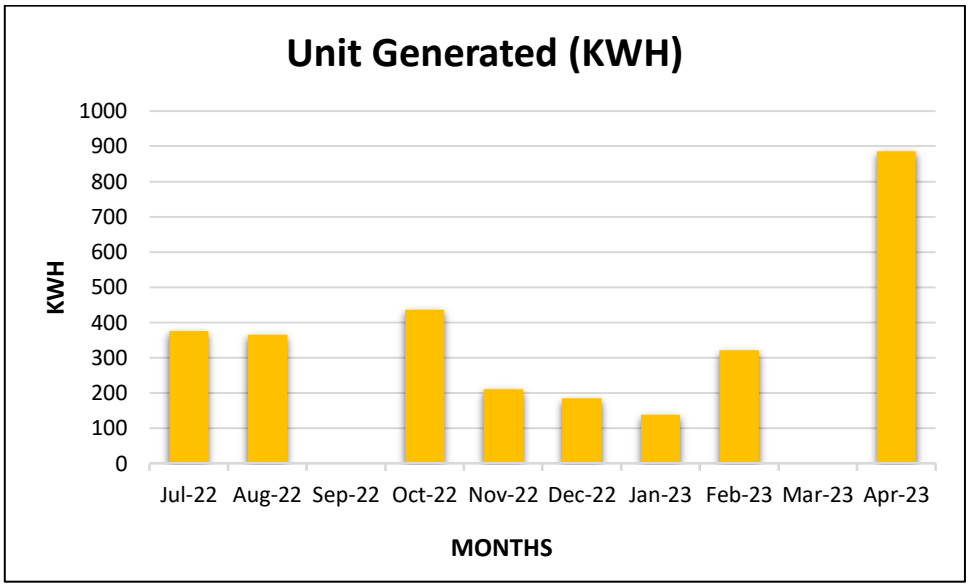



Power Factor
0.98
0.97
0.97
0.96
0.96
0.95
0.95
0.94
PF
Jul-22
Aug-22
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
Months


Total amount Payable
300000
250000
200000
150000
100000
50000
0
in Rs
Jul-22
Aug-22
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
Months

There is an inhouse Solar Generation plant provided on the new building, data is collected and scrutinized:

Solar Generation	
Months	Unit Generated (KWH)
Jul-22	376
Aug-22	364
Oct-22	436
Nov-22	210
Dec-22	184
Jan-23	138
Feb-23	320
Apr-23	886



Chapter 03: Lighting System

Following is the list of lights installed in the campus at various locations:

Type of Lights	Location	Rating (Watts)	Quantity	Number of Hours being turned on
LED Bulbs & LED Tube lights	Library, Staffroom, Administrative block, Labs, Classroom	10	10	8
		20	400	8
		12	8	12
		9	10	12
		18	7	12

Observation:

It was observed that energy efficient LED lights are installed in the campus. College management has replaced all the conventional lights such as fluorescent lights, CFL etc with LED lights which is a great initiative.

Recommendation:

- Sticker to SWITCH OFF LIGHT and SAVE ENERGY to be displayed at prominent locations.
- Regular cleaning of light fixtures to be done to get maximum lux level.

Chapter 04: Pumps and Motors

The details of the pumps and motors used in the campus are given below:

Name of Pump/Motor and make	Running Hours	Any VFD	Rated Capacity in KW
Crompton 3HP	3	No	2.20
Crompton 5HP	3	No	3.70
Crompton 12HP	3	No	9.00

Observation:

All pumps and motors are functioning properly and well maintained.

Recommendation:

Proper maintenance and upkeep of pump and motor to be done.

Chapter 05: Air Conditioning

Split and Window Air Conditioners are used in the facility for air conditioning. Following is the list of ACs present in the campus:

Type of Air Conditioner	Capacity in Ton	Quantity	Star Rating	Set Temperature	Running Hours	Whether AC performance is satisfactory
Window AC	0.5	4	3	24	8	Yes
Window AC	1.5	6	-	24	8	Yes
Window AC	2	1	-	24	8	Yes
Split AC	1.5	39	-	24	8	Yes
Split AC	2	1	-	24	8	Yes

Observation:

- All air conditioners are found to be functioning properly and well maintained.

Recommendation:

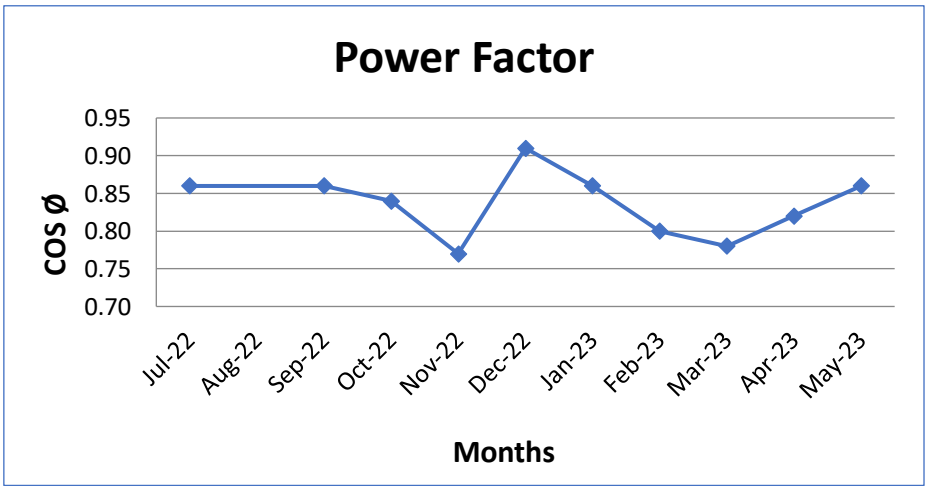
- All doors to be kept closed while using the air conditioners and regular annual service of AC's should be carried out.
- Set Temperature of Air Conditioner shall be maintained at 26°C to get desired efficiency and energy savings.
- A reduction in 1°C set point temperature, the energy cost comes down by 5%. By carefully selecting the seasonal temperature in different areas as per requirement considerable saving on account of power consumption can be achieved.
- Whenever Air Conditioners are replaced in future, BEE 5 star rated air conditioners shall be considered which are highly efficient.

Chapter 06: Energy Saving Proposals

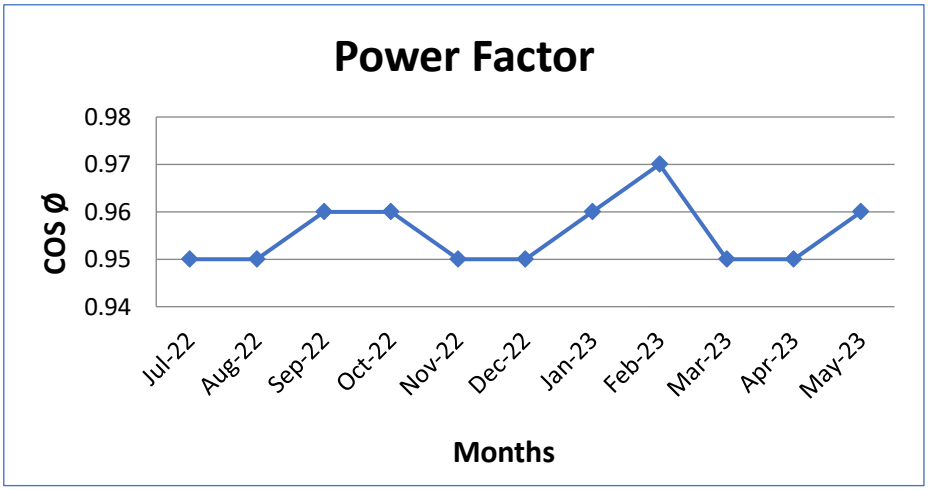
Energy Saving Proposal No.1
Maintenance of APFC panel for achieving Power Factor to 0.99

1. Swami Shraddhanand College is getting power supply from Tata Power Delhi Distribution Limited through 2 energy meters. The supply company charges NDS (Non-Domestic supply) tariff on the basis of KVAH

2. Analysis of energy bills for last 10 months was done for meter number 60006159861 and it was found that power factor was varying from 0.77 to 0.91 and average power factor is 0.84. The variation of power factor is shown within the graph:



3. Analysis of energy bills for last 11 months was done for meter number 60007761947 and it was found that power factor was varying from 0.95 to 0.97 and average power factor is 0.96. The variation of power factor is shown within the graph:



4. As tariff is charged on basis of KVAH. As the power factor reduces KVAH increases.

5. It is recommended that proper upkeep of APFC Panel should be done to maintain the power factor near unity and reduce the energy charges.

6. Following saving shall be achieved if the power factor was maintained at 0.999.

Months	Recorded Power Factor as per Energy Bill	Current Unit Consumption (KVAH)	Unit Consumption if Power Factor was maintained at 0.99 (KVAH)	Difference
Jul-22	0.86	13918	12090	1828
Sep-22	0.86	22831	19833	2998
Oct-22	0.84	11452	9717	1735
Nov-22	0.77	6966	5418	1548
Dec-22	0.91	11159	10257	902
Jan-23	0.86	9253	8038	1215
Feb-23	0.80	8053	6507	1546
Mar-23	0.78	7821	6162	1659
Apr-23	0.82	7667	6350	1317
May-23	0.86	7236	6286	950
			Total	**15697**
			Cost per Unit	**8.50**
			Annual Savings	**133423**
			Payback Period	**Immediate**

Months	Recorded Power Factor as per Energy Bill	Current Unit Consumption (KVAH)	Unit Consumption if Power Factor was maintained at 0.99 (KVAH)	Difference
Jul-22	0.95	14316	13738	578
Aug-22	0.95	15593	14963	630
Sep-22	0.96	15047	14591	456
Oct-22	0.96	17974	17429	545
Nov-22	0.95	8450	8109	341
Dec-22	0.95	6666	6397	269
Jan-23	0.96	6840	6633	207
Feb-23	0.97	9382	9192	190
Mar-23	0.95	4606	4420	186
Apr-23	0.95	5334	5118	216
May-23	0.96	9454	9168	286
Jun-23	0.97	14102	13817	285
			Total	4190
			Cost per Unit	8.50
			Annual Savings	35612
			Payback Period	Immediate

Total Savings of Rs 1,69,035 could be done annually if power factor was maintained at 0.99 with investment of Rs 20,000 (Cost of maintenance of APFC panel) with payback period of nearly 2 months.

Conclusion

The energy audit performed at Swami Shraddhanand College has shown that the college has made commendable efforts towards sustainability. To continue reducing energy consumption, the college is advised to implement the recommendations outlined in the report.

The recommended control measures were based on observation and experience of the energy audit team.

End of Report

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