Energy Audit

Certificate of Energy Audit

PPS Energy Solutions

PPS Energy Solutions Pvt. Ltd.
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Date: 30th December 2021

WORK COMPLETION CERTIFICATE

TO WHOMSOEVER IT MAY CONCERN

This is to certify that, we M/s. **PPS Energy Solutions Pvt. Ltd.** has successfully completed **Energy and Green Audit at Matoshree Vimalabai Deshmukh Mahavidyalaya, Amravati conducted in December 2021** and submitted report.

For PPS Energy Solutions Pvt. Ltd, Pune

PPS ENERGY SOLUTIONS PVT. LTD. PPS

Dr. Ravi. G. Deshmukh
Director

DETAILED ENERGY AUDIT REPORT

MATOSHREE VIMALABAI DESHMUKH MAHAVIDYALAYA

Panchvati Chouk, Amravati

444601

Dec-2021

Conducted By

PPS Energy Solutions Pvt. Ltd.

Engineering Consultants

Plot No-18, Girish Housing Society

Warje, Pune – 411058, Maharashtra, India

Dr. Ravi G. Deshmukh

Energy Auditor Class - A

MEDA/ECNCR-05/2018-19/EA-05

PREFACE

Energy Audit is a key parameter of systematic approach for decision-making in the area of energy management. It attempts to determine how and where energy is used and to identify methods for energy savings. There is now a universal recognition of the fact that new technologies and much greater use of some that already exists provide the most hopeful prospects for the future. The opportunities lie in the use of existing renewable energy technologies, greater efforts at energy efficiency and the dissemination of these technologies and options.

As per the Energy Conservation Act, 2001, Energy Audit is defined as "the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption".

Present energy audit is a mare mile marker towards destination of achieving safe, healthy and energy efficient unit. We would like to emphasize that an energy audit is a continuous process. We have compiled a list of possible actions to conserve and efficiently utilize our scarce resources and identified their savings potential. The next step would be to prioritize their implementation. Implementation of recommended measures can help consumes to achieve significant reduction in their energy consumption levels.

WHY ENERGY AUDIT?

An energy audit determines the amount of energy consumption affiliated with a facility and the potential savings associated with that energy consumption. Additionally, an energy audit is designed to understand the specific conditions that are impacting the performance and comfort in your facility to maximize the overall impact of energy-focused building improvements.

An energy audit is a systematic review of the energy consuming installations in a facility to ensure that energy is being used sensibly and efficiently. An energy audit usually commences with the collection and analysis of all information that may affect the energy consumption of the facility, then follows with reviewing and analyzing the condition and performance of various installations and facility management, with an aim at identifying areas of inefficiency and suggesting means for improvement.

Through implementation of the suggested improvement measures, facility owners can get the immediate benefit for paying less energy bills. On the other hand, lowering of energy consumption in facility will lead to the chain effect that the power supply companies will burn less fossil fuel for electricity generation and relatively less pollutants and greenhouse gases will be introduced into the atmosphere, thus contributing to conserve the environment and to enhance sustainable development.

ACKNOWLEDGEMENT

We express our sincere gratitude to the authorities of Matoshree Vimalabai Deshmukh Mahavidyalaya, Amravati for entrusting and offering the opportunity. It is our immense pleasure to present the detailed energy audit report.

We acknowledge the positive support from management in undertaking the task of Detailed Energy Audit of all electrical system, thermal systems, utilities and other area and for continuous help and support before and during the Detailed Energy Audit.

We are also thankful to all field staff and agencies working with whom we interacted during the field studies for their wholehearted support in undertaking measurements and eagerness to assess the system / equipment performance and saving potential. We admire the help of all concerned staff for their active participation in completing official documentations.

We express our sincere gratitude to the authorities of Matoshree Vimalabai Deshmukh Mahavidyalaya, Amravati for entrusting PPS Energy Solutions Pvt. Ltd.

For PPS Energy Solutions Pvt. Ltd.

Dr.Ravi G. Deshmukh
Energy Auditor Class - A
MEDA/ECNCR-05/2018-19/EA-05

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About PPSES

M/s. PPS Energy Solutions Pvt. Ltd (PPSES) is an ambitious company, established by enterprising engineering professionals in the year 2009. The company offers services pertaining to Energy and Engineering to clients across the globe. Our team is based in Pune, a city known for its Software and Engineering talent in India. We are a rapidly growing company with a team of about 100 people which includes highly trained and experienced Techno-Managers, Analysts, and Engineers & Detailers.

We are presently working in India (Maharashtra, Assam, Madhya Pradesh, Gujarat, Andhra Pradesh, Delhi, Orissa, Chhattisgarh, Bihar, Andhra Pradesh, Telangana and Jharkhand) and Abroad (Bahrain, Stanford)

- We serve in majorly four areas,
  - Energy Audit, Management and System Evaluations
  - Power Distribution System Design, Evaluations and Monitoring
  - MEP Design and Project management
  - Research and Training

PPSES Team Members

Name	Role	Academics and Expertise
Dr. Ravi Deshmukh	ECM verification, Report verification and presentation	Accredited Energy Auditor, PhD, M tech, MBA (Power), Graduate E&TC Engineer with over 18 years of experience in Energy Management, Management of Power System, street light projects, Power Exchange Operations, Power Trading and Analysis, Electrical Automation. Has worked as Expert in Iron & Steel sector and Energy
Mr .Nilesh Saraf	Co-ordination with officers, project status review.	Expert in Energy sector with 16 years of experience in Energy efficiency assessment, Industrial engineering sector & Renewable Energy.
Mr. Vinayak Apte	Energy Audit Expert	Graduate Electrical Engineer with more than 10 years of experience in various sectors. He handled Energy Audits, Energy Conservation and Energy Efficiency projects in Industries, Commercial and Residential Buildings, Pump House
Mr. Vedmurthy Swamy	Field study, data tabulation and analysis, report preparation	Graduate Mechanical Engineer with 5 years of experience in project management, energy efficiency assessment
Mrs. Prajakta Joshi	Field study, data tabulation and analysis, report preparation	Graduate Electrical Engineer with3 years of experience in project management, energy efficiency assessment

1. EXECUTIVE SUMMARY

Detailed Energy Audit was undertaken in order to evaluate energy performance and identify potential energy conservation measures. Detailed Energy Audit was undertaken in three steps, i.e. document review of data and information initially provided by facility, site visit and preparation of this report.

Energy Audit team conducted the site visit. The site visit includes interaction with staff, electricians of facility, the collection/review of further data and a field inspection of the facility and equipment.

The salient observations and recommendations are given below.

1. The Total Cost of Energy is around **Rs. 1,03,509/-** per Annum
2. Average monthly units consumed are **2640 kWh** equivalent to **Rs. 9200/-**
3. Average electricity charges works out to be **Rs. 6.94/-**

This brief report has therefore sought to provide a high-level overview of the status of energy efficiency at facility, combined with an illustration of areas where further, previously unidentified savings opportunities may exist.

Our survey has identified further potential opportunities, ranging from "no & low cost" measures, through to those that will require significant capital expenditure.

Note: Investment figures mentioned in are only indicative, further detailed study is recommended.

Summary of Recommended Energy Conservation Measures:

Sr. No.	Equipment Name	ECM Details	Investment (Rs. In Lacs)	Savings (kWh/year)	Carbon credit (Tons of Co2)	Saving (Rs.In Lacs /Year)	Payback (Years)
1	Tube Lights	Replacement of conventional lights with suitable LEDs	0.89	3000	2.55	0.21	4.28
2	Fans	Replacement of existing fans with energy efficient Super fans	1.65	6683	5.68	0.46	3.55
Total			**2.54**	**9683**	**8.23**	**0.67**	**3.78**

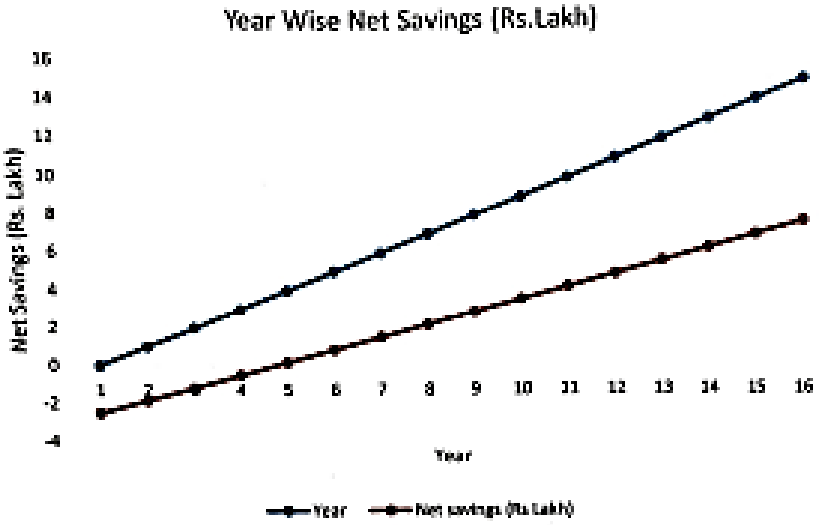
Note: Estimated savings may base on operating conditions

During the Energy Audit, Total Estimated Investment of Rs 2.54 Lac/- yields Total Estimated Savings of Rs. 67000/- which 65 % of the Total Energy Cost of Rs. 1,03,509 /- with an overall payback period of 3.78 Year.

Other Recommendations:

A. Regular cleaning and maintenance of equipment's is important to reduce energy losses.
B. Use of star rated equipment's is also strongly recommended specially in case of Fans.
C. Cleaning of ceiling fan and exhaust fan blades will reduce the drag on the fan and intern will reduce energy loss.
D. Awareness amongst energy users is very essential step to reduce wastage of electricity
E. Energy conservation awareness programs can be conducted once a year. Increasing energy awareness of energy users motivates them to work as a team can lead to reductions in energy consumption and save the money.

Year	Investment (Rs. In Lacs)	Saving (Rs.In Lacs /Year)	Cum Savings(Rs Lakh)	Net savings (Rs Lakh)
0	-3	0	0	-3
1	0	1	1	-2
2	0	1	1	-1
3	0	1	2	-1
4	0	1	3	0
5	0	1	3	1
6	0	1	4	1
7	0	1	5	2
8	0	1	5	3
9	0	1	6	4
10	0	1	7	4
11	0	1	7	5
12	0	1	8	6
13	0	1	9	6
14	0	1	9	7
15	0	1	10	8



Net Savings (Rs.Lakh Vs Year)

Dr. Ravi G. Deshmukh
Energy Auditor Ltd - A
MEDA/ECNOR-05/2018-19/EA-05

2. GENERAL AUDIT REVIEW

Facility can implement faster payback energy conservation measures (ECMs) which have already been considered and for which the ECMs are fully developed.

Other General Points:

1. Energy conservation awareness programs can be conducted once a year. Increasing energy awareness of staff, students and motivating them to work as a team can lead to reductions in energy consumption and save the money. Savings estimates range in the order of 5 to 10%. When implemented effectively these savings can be realized quickly and cost effectively.
2. Most of the fans are of older design and not energy efficient.
3. Most of the places the tube light installed are energy efficient and fittings are in healthy condition.
4. Natural day light is efficiently used in corridor and few classrooms and labs areas.

It is believed that with the current approach and organization of energy management, energy can be reduced in a systematic, cost effective manner. We hope that this report will help facility to implement these changes and provide direction to the Energy Management Team.

3. ABOUT ENERGY AUDIT

Objective

The overall objective of the assignment is to quantify energy saving in existing system and achieve reduction in energy consumption pattern.

Hence the detail objectives are as under,

1. To calculate the energy consumption
2. To evaluate the performance of the equipment
3. To find out the energy saving opportunities
4. To quantify the total energy savings
5. To find out the ways to achieve energy efficiency

3.1. Scope of Work

Following is the scope of work envisaged for this assignment,

Data Collection

To collect the details of various electrical and mechanical system and their ratings, the available drawings and details shall be studied. Detail load list shall be prepared and checked.

A, B, C Analysis

With the details available from load list, analysis shall be carried out depending on the present usage trends. All the power consuming equipment's shall be classified in three categories depending on their ratings, condition and operating time. The area for larger potentials for savings shall be identified.

Field Study

The detail field study on site shall include the following as well as all other measures required for energy audit study,

a. Lay out the system and study of Electrical distribution
b. Study of area wise power distribution and Measurement of power consumption
c. Study of instrumentation provided
d. Measurement of motor currents, voltages, power etc. parameters by energy analyzer and measurement of water flow, pressures etc. parameters of pumps simultaneously and other measurements as needed to characterize the system and required for calculating efficiency at various combinations

e. Study of air conditioner operations and system requirements

f. Analysis of readings obtained from field with the standard consumption.

3.2. Approach and Methodology

1. Understanding the Scope of Work and Resource Planning
2. Identification of Key Personnel for the assignment/ project
3. Structured Organization Matrix
4. Steps in preparing and implementing energy audit assignment
   a) Discussions with key facility personnel
   b) Site visits and conducting "walk-through audit".
   c) Preliminary Data Collection through questionnaire before audit team's site visit
   d) Steps for conducting the detailed audit
      - Plan the activities of site data collection in coordination with the facility in-charge.
      - Study the existing operations involving energy consumption
      - Collect and collate the energy consumption data with respect to electricity consumption
      - Conduct performance tests to assess the efficiency of the system equipment/ electricity distribution, lighting, and identify energy losses.
      - Discuss with facility personnel about identified energy losses.
5. List proposed efficiency measures
   - Develop a set of potential efficiency improvement proposals
   - Baseline parameters
   - Data presentation
   - System mapping
   - List of potential Energy Savings proposals with cost benefit analysis.
   - Review of current operation & maintenance practices
6. Preparation of the Draft Energy Audit Report
7. Preparation and submission of final Energy Audit Report after discussion with concerned persons

4. ENERGY DETAILS

Maharashtra State Electricity Distribution Company Limited (MSEDCL) provides the electricity supply for facility. Billing is carried out with the help of Dual meter according to 73/LT-X B Tariff.

Detailed Energy Audit was conducted for the load connected to the mains supply used.

Mainly energy is used on this facility for the following purposes:

1) Lighting Load
2) Ceiling Fans

Based on above it is clear that followings Equipments have highest potential for energy savings

Table 1 Name of Area

Sr. No.	Name of the Area
1	Tube Lights
2	Fan

4.1. Electricity Bill Analysis

1. Consumer Details of Meter No. 06503416399

Consumer Details

Table 2 Consumer Details

Parameter	Details
Consumer No.	**366470078825**
Consumer Name	Principal College Of Rural Services
Address	Rural Institutered Amravati
Pin Code	444603
Sanction load (KW)	5
Tariff	73/LT-X B I 0-20KW Pub Ser oth

Consumption Details

Table 3 Billing Data

Month	kWH	Avg KWH	Fixed Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)	Total Unit Rate (INR)
Jan-21	913	1802	362	1324	4437	83	6206	6.80
Feb-21	1200	1802	362	1740	5832	228	8162	6.80
Mar-21	947	1802	362	1373	4602	180	6518	6.88
Apr-21	1132	1802	363	1636	5487	216	7701	6.80
May-21	2104	1802	373	2904	9847	401	13524	6.43
Jun-21	1093	1802	373	1508	5115	208	7205	6.59
Jul-21	4068	1802	373	5614	19038	775	25800	6.34
Aug-21	2120	1802	373	2926	9922	404	13624	6.43
Sep-21	4789	1802	1865	6609	22413	912	-28354	-5.92
Oct-21	1183	1802	373	1633	5536	225	7917	6.69
Nov-21	1306	1802	373	1802	6112	249	8536	6.54
Dec-21	767	1802	373	1058	3590	146	5167	6.74
Avg	1802		506	2618	8863	358	6891	5.59
Max	4789		1865	6609	22413	912	25800	6.88
Min	767		362	1058	3590	146	-28354	-5.92
Sum	21622		5563	28802	97494	3943	75800	

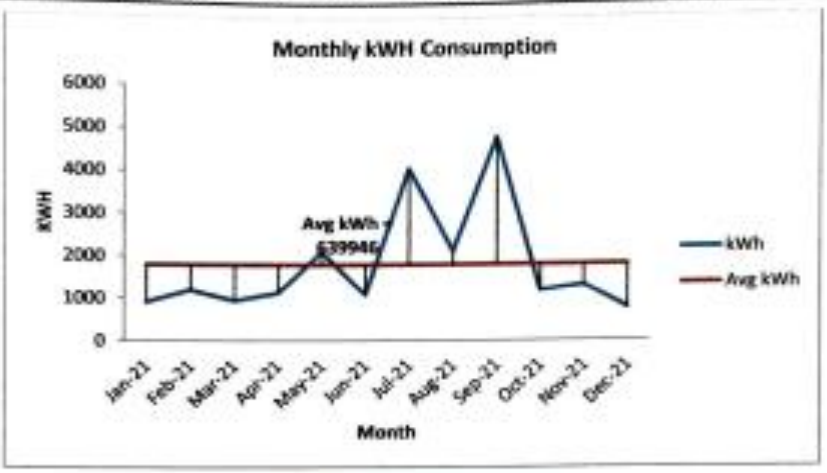


Figure 1 Monthly kWh Consumption

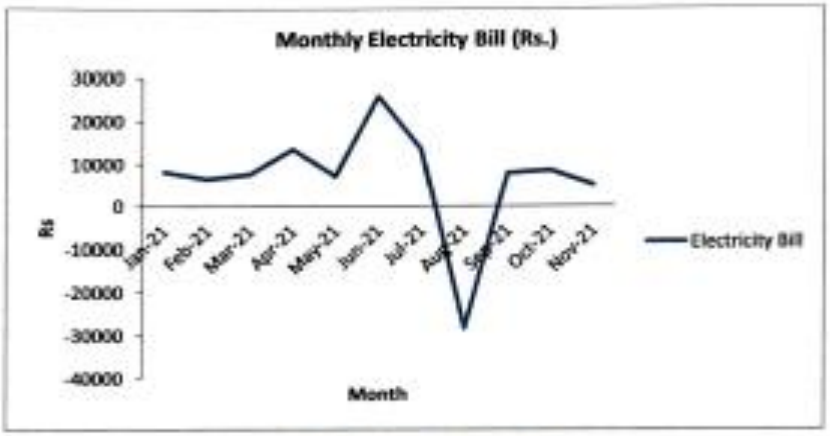


Figure 2 Monthly Electricity Bill

2. Consumer Details of Meter No. 05309072537

Table 4 Consumer Details

Parameter	Details
Consumer No.	366470788873
Consumer Name	Principal Matoshree Vimalabai Deshmukh Mahavidyalaya
Address	Shivaji Nagar Panchvati Chowk
Pin Code	444601
Sanction load (KW)	5.55
Tariff	73/LT-XB I 0-20 KW Pub Ser oth

Table 4 Billing Data

Month	kWH	Avg KWH	Fixed Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)	Total Unit Rate (INR)
Jan-21	778	838	362	1116	3738	70	-33430	-42.97
Feb-21	356	838	362	516	1730	68	2676	7.52
Mar-21	170	838	362	247	826	32	1467	8.63
Apr-21	367	838	363	531	1781	70	1640	4.47
May-21	1709	838	373	2358	7998	325	11055	6.47
Jun-21	267	838	373	368	1250	51	2042	7.65
Jul-21	1935	838	373	2670	9056	368	12468	6.44
Aug-21	994	838	373	1372	4652	189	6586	6.63
Sep-21	917	838	373	1265	4292	175	6105	6.66
Oct-21	993	838	373	1370	4647	189	6580	6.63
Nov-21	762	838	373	1052	3566	145	5136	6.74
Dec-21	802	838	373	1107	3753	153	5386	6.72
Avg	**838**		**369**	**1164**	**3941**	**153**	**2309**	**6.78**
Max	**1935**		**373**	**2670**	**9056**	**368**	**12468**	**8.63**
Min	**170**		**362**	**247**	**826**	**32**	**-33430**	**-42.97**
Sum	**10050**		**4433**	**13973**	**47289**	**1836**	**27709**	

Figure 3 Monthly kWh Consumption

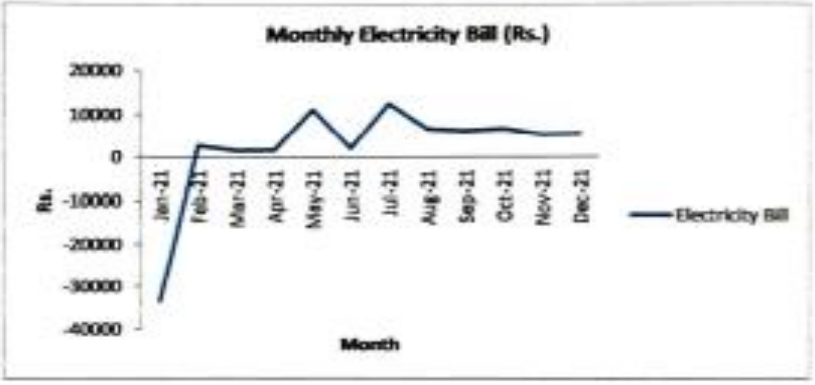


Figure 4 Monthly Electricity Bill

Comments:

1. Average monthly units consumed is 2640 kWh equivalent to Rs. 9200/-
2. Average electricity charges works out to be Rs. 6.94/-

4.2. Connected Load Quantity of Buildings

Table 4 Connected Load of Facility

Room No.	Room/lab /office	LED	Tube	Fan	Computer	Laptop	Printer	Projector	Xerox M/C	Oven	Freaz	Total
Wattage		20	40	75	150	150	150	150	700	2000	750	4185
1	Physics Lab		10	6								16
2	Comp. Lab		4	2	11		1					18
3	Economics		2	1								3
4	Electronics		3	3		1						7
5	ENGLISH		4	3		7	1	1	1			17
6	CDE	1	2	2		1						6
7	Labarary	1	17	10	1	1						30
8	Staff room	1	1	1								3
9	Biology		11	7	1					1		20
10	Textile and clothing	1	4	3								8
11	Human development	1	3	2								6
12	Resource manegmant		5	2								7
13	Extemion	1	3	2								6
14	Store room		1									1
15	Food and nutrition And home economics		8	4						3	2	17
16	Store room											0
17	Girls toilet											0
18	H.Sc. V.C.		2	2	2							6
19	H. Sc. V.C		2	2								4
20	Chemistry lab		10	6	1		1				1	19
21	Ledies toilet		1									1
22	Gents toilet		1									1
23	NCC office and Hindi department		1	1								2
24	Principal office	3	2	2					1			8
25	College office	2	5	5	8		5					25
26	Botany Lab	6		3								9

Room No.	Room/lab /office	LED	Tube	Fan	Computer	Laptop	Printer	Projector	Xerox M/C	Oven	Frez	Total
27	Physical education Sports dept.	1	1	2								4
28	Hedical room											0
29	Boys Toilet											0
30	Dep. FDT		3	2								5
31	Staff room		2	2								4
32	of FDT											0
33	MLT lab		3	1								4
34	Lab cookery		5	3							1	9
35	Garden side coridour		2									2
36	Office backside coridor		1									1
37	Home science coridour	1	1									2
38	coridour		3									3
39	Music room		1	1								2
40	Class room											0
41	Class room											0
42	A/v hall		1	5				1				7
43	Class room											0
44	Class room		2	3								5
45	Ledies staff room		1	2								3
46	Class room		2	3								5
47		1		3								4
48	Class room		2	3								5
49	hall		9	9								18
50	co coparative store		1									1
51	Boys common room		2									2
52	Class room	1		3								4
53	Class room											0
54	Class room											0
55	Girls commoñ room			1								1

Room No.	Room/lab /office	LED	Tube	Fan	Computer	Laptop	Printer	Projector	Xerox M/C	Oven	Freez	Total
56	Class room		2	3								5
57	NSS dep.		1	1								2
58	Upper coridour		2	1								3
	HOSTEL											
59	Hostel office		1	1								2
60	Room		1	1								2
61	Room		1	1								2
62	Room		1	1								2
63	Room		1	1								2
64	Room		1	1								2
65	Room		1	1								2
66	Room		1	1								2
67	Room		1	1								2
68	Room		1	1								2
69	Room		1	1								2
70	Room		1	1								2
71	Room		1	1								2
72	Room		1	1								2
73	Room		1	1								2
74	Room		1	1								2
75	Room		1	1								2
76	Worden room		1	1								2
77	porch		1	2								3
78	Gard room	1		1								2
79	Hostel ground toilet		1									1
80	First flour		1									1
Total		22	170	138	24	10	8	2	2	4	4	384
Tota KW		440	6800	10350	3600	1500	1200	300	1400	8000	3000	36590

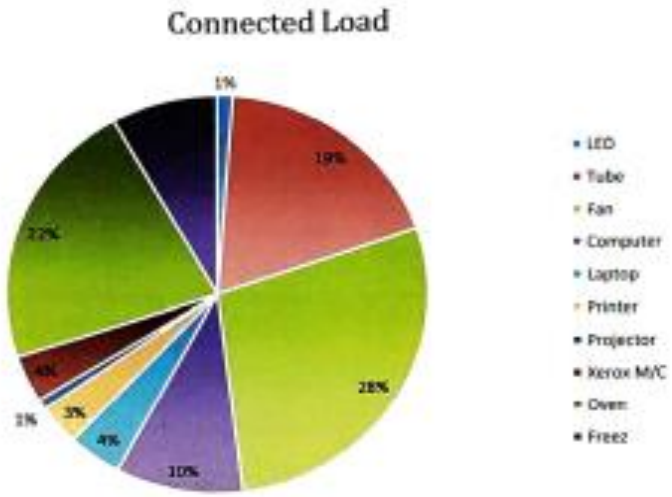


Figure 5 Distribution of Connected Load

5. ENERGY CONSERVATION MEASURES

ECM 1: Replacement of Tube Lights with More Efficient Lights

ECM No.	Energy efficiency improvement measures	Investment Rs. In Lakh	Estimated Saving		Estimated Savings Rs. In Lacs	Estimated Payback Years
			Electricity kWh	Carbon credit (Tons of CO_2)		
1	Replacement of conventional lights with suitable LEDs	0.89	3000	2.55	0.21	4.28

Observations:

Facility has installed Tube Lights of 40 watt in their premises

Recommendations:

During energy audit, it is observed that facility has installed Tube Lights of 40 watt at some of the places in the facility. Also energy team at facility has already replaced some of the CFLs with LEDs. The operating hours for these lightings are around 5 hours. LED Lights of 20 watt with equivalent LED fixture thereby achieving significant reduction in energy consumption. The LEDs could be replaced in such a manner that it has same fixture so there will not be retrofitting cost attached to the replacement. The replacement could be done in a phased manner. LED lights have better efficacy as well as better lifetime than conventional lights.

Energy Saving Calculations:

Particular	Unit	Value
Energy Saving Calculation		
Power consumption of TL lamps	KW	4.00
Power consumption of suitable LED light	KW	2.00
Average power saving after replacement with LED light	KW	2.00
Replacement of conventional lights TL of 40W with suitable LEDs	Nos	100
Average working hour per day	Hrs	5
No. of working days in a year	Days	300
Cost Benefit Calculation		
Annual Energy Saving potential	kWh	3000
Electricity tariff	Rs/unit	6.94
Annual Cost Saving	Rs. Lakh	0.21
Total investment cost	Rs. Lakh	0.89
Annual Saving	Rs. Lakh	0.21
Simple Payback Period	Years	4.28

Type of Exisitn g Fitting	Watt age	Qt y	Propos ed LED W	Price - Rs/U nit	Dismant eling Cost	Total Cost	Existi ng KW	Propos ed KW	Save d kW	Investm ent Rs Lakh
Tube Light	40	10 0	20	878	13	89100	4	2	2	0.89
TOTAL	**40**	**10**	**20**	**878**	**13**	**89100**	**4**	**2**	**2**	**0.89**

ECM 2: Replacement of Old Fan with Energy Efficient Super Fan

ECM No.	Energy efficiency improvement meesures	Investment Rs. In Lakh	Estimated Saving		Estimated Savings Rs. In Lacs	Estimated Payback Years
			Electricity kWh	Carbon credit (Tons of CO_2)		
2	Replacement of existing fans with energy efficient Super fans	1.65	6683.34	5.68	0.46	3.55

Observations:

During energy audit, it is observed that facility has old 75 watts fan and its energy consumption is on higher side.

Recommendations:

During energy audit it is observed that facility has installed non star rated fan of 75 watts so we recommend to replace energy consuming fan with energy efficient super fan

6. List of Instruments

POWER ANALYSER

Picture 1 ALM 20 Power Analyzer

ALM 20 Power Analyzer is designed for Measuring power network parameters

TECHNICAL SPECIFICATIONS

Number of channels	3U/3I
Voltage (TRMS AC + DC)	100V to 2000V ph-ph /50V to 1000V ph-N
Voltage ratio	Up to 650 kV
Current (TRMS AC + DC)	5mA to 10,000 Aac / 50 mA to 5,000 Adc (depending on Clamp)
Current ratio	Up to 25 kA
Frequency	42.5 - 69 Hz, 340 - 460Hz
Power values	W, VA, VAr, VAD, PF, DPF, cos ø, tanø
Energy values	Wh, VAh, VArh
Harmonics, THD	on V, U, I & In up to 50th order
Electrical safety	IEC 61010, 1000V CAT III / 600V CAT IV
Protection	IP54

DIGITAL CLAMP METER

Picture 2 MECO 3150 DIGITAL CLAMP METER

Power Clamp meter is a Portable Digital multi-functional measuring instrument. Designed for Measuring selected power network parameters, AC/DC Voltage, AC/DC current, Resistance, Continuity, Diode and Frequency.

TECHNICAL SPECIFICATIONS

DC VOLTAGE (Auto Ranging)	
Ranges	4V, 40V, 400V, 1000V
Overload Protection	1200V DC/800V AC
AC VOLTAGE (Auto Ranging) 40-500Hz	
Range	4V, 40V, 400V, 750V
Overload Protection	1200V DC/800V AC
RESISTANCE (Auto Ranging)	
Range	400Ω, 4KΩ, 40KΩ, 400KΩ, 4MΩ, 40MΩ
Test Current	0.7mA on 400Ω, 0.1mA on 4KΩ
Diode Test	
Measurement Current	1.0 ± 0.6 mA Approx
Open Circuit Voltage	0.4V Approx
Overload Protection	500V DC / AC
Frequency (Auto Ranging)	
Range	10.00Hz, 50.00Hz, 500.0Hz, 5.000kHz, 50.00kHz, 500.0kHz
Sensitivity	3V
Overvoltage Protection	200V DC or AC peak

DIGITAL CLAMP METER

Picture 3 RISH POWER CLAMP 1000 A/400 A AC-DC

Power Clamp meter is a Portable Digital multi-functional measuring instrument. Designed for Measuring selected power network parameters, AC/DC Voltage, AC/DC current, Resistance, Continuity, Diode and Frequency.

TECHNICAL SPECIFICATIONS

Measuring function	Measuring range
kWh	9.999 kWh
	99.99 kWh
	999.9 kWh
	9999 kWh
Ahr	999.9 Ahr
Phase angle	0.0°....360.0°
Power Factor	-1...0...1
Harmonics (RMS & %)	1...13
	14...49
THD	0...99.9%
Crest Factor	1.0...2.9
	3.0...5.0
Power Clamp 1000A peak	1400 A/ 1400 V
Power Clamp 400A peak	100 A
	560 A/ 1000 V
Power Clamp 1000A INRUSH	999.9 A
Power Clamp 400A INRUSH	99.99 A
	400 A
Resistance	9999 Ohm
Continuity	Below 40 Ohm

THERMAL IMAGER

Picture 4 FLIR TG 167 Thermal imager

FLIR TG 167Thermal imager is designed to easily find unseen hot and cold spots in electrical cabinets or switch boxes, giving you quality image detail on even small connectors and wires.

TECHNICAL SPECIFICATIONS

Accuracy	±1.5% or 1.5°C (2.7°F)
Detector Type	Focal plane array (FPA), uncooled micro bolometer
IR Resolution	80 × 60 pixels
Laser	Dual diverging lasers indicate the temperature measurement area, activated by pulling the trigger
Memory Type	Micro SD card
Object Temperature Range	-25°C to 380°C (-13°F to 716°F)
Thermal Sensitivity/NETD	<150 mK
Display	2.0 in TFT LCD

INFRARED THERMOMETER

Picture 5 HTC IRX 64 Infrared thermometer

HTC IRX 64 infrared thermometer is useful instrument to measure the surface temperature. Infrared thermometers are ideal for taking temperatures need to be tested from a distance. They provide accurate temperatures without ever having to touch the object you're measuring (and even if your subject is in motion).

TECHNICAL SPECIFICATIONS

Specification	Range
IR	-50℃~1050 ℃
Contact	-50℃~1370 ℃
IR Temp. Resolution	0.1℃
Basic Accuracy	+/- 1.5% of reading
Emissivity	Adjustable 0.10 ~ 1.0
Optical resolution	30 : 1

LUX METER

Picture 6 Nishant NE 1010 Lux meter

Nishant NE 1010 Lux meter is used to measure the lux levels.

TECHNICAL SPECIFICATIONS

Measuring range	0 Lux ☐200, 000 Lux/0 Fc☐185, 806 Fc
Accuracy	± 3% rdg ± 0.5% f.s.(<10,000 Lux)
	± 4% rdg ± 10% f.s.(>10,000 Lux)
Digital Updates	2 times/s
Photometric sensor	Silicon diode
Battery life	18 hours (continuous operation)
Operating temperature and humidity	0°C ☐40°C, 10% RH ☐80% RH
Storage temperature and humidity	-20°C ☐60°C, 10% RH ☐80% RH
Power	9V battery
Unit Size	52.5 x 52.5 x 166 mm
Auto power off	After 5 minutes

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Energy Auditor Class - A
MEDA/ECNCR-05/2018-19/EA-05