ENERGY AUDIT

CONSULTATION REPORT

SHIVAJIRAO KADAM INSTITUTE OF TECHNOLOGY & MANAGEMENT

Near Ralamandal Sanctuary,
Tillore Khurd, Indore
(M.P.)

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED
Flat No. 201, OM Apartment,214 Indrapuri Colony,
Bhawarkuan, Indore – 452 001 (M. P.), India
0731-4948831, 7869327256
Email ID:eempirical18@gmail.com
www.eeplgroups.com

(Academic Year 2021-22)

CONTENT

ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore takes this opportunity to appreciate & thank the management of **"Shivajirao Kadam Institute of Technology & Management"** Ralamandal Sanctuary, Tillore Khurd, Indore (M.P.) for giving us an opportunity to conduct energy audit for the institute.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

Rajesh Kumar Singadiya

(Director)

M.Tech (Energy Management), PhD (Research Scholar)

Accredited Energy Auditor [AEA-0284]

Certified Energy Auditor [CEA-7271]

(BEE, Ministry of Power, Govt. of India)

Empanelled Energy Auditor with MPUVN, Bhopal M.P.

Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi

Certified Water Auditor (NPC, Govt of India)

Charted Engineer [M-1699118], The Institution of Engineers (India)

Member of ISHRAE [58150]

Certificate of Accreditation

ENERGY IS LIFE
BEE
CONSERVE IT

BUREAU OF ENERGY EFFICIENCY

Examination Registration No.: EA- 7271
Accreditation Registration No.: AEA-284

Certificate of Accreditation

This is to certify that Mr./Ms. Shri. Rajesh Kumar Singadiya having its trade/registered office at ..... has been given accreditation as accredited energy auditor. The certificate shall be effective from 9th day of May, 2018

The certificate is subject to the provisions of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

This certificate shall be valid until it is cancelled under regulation 9 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

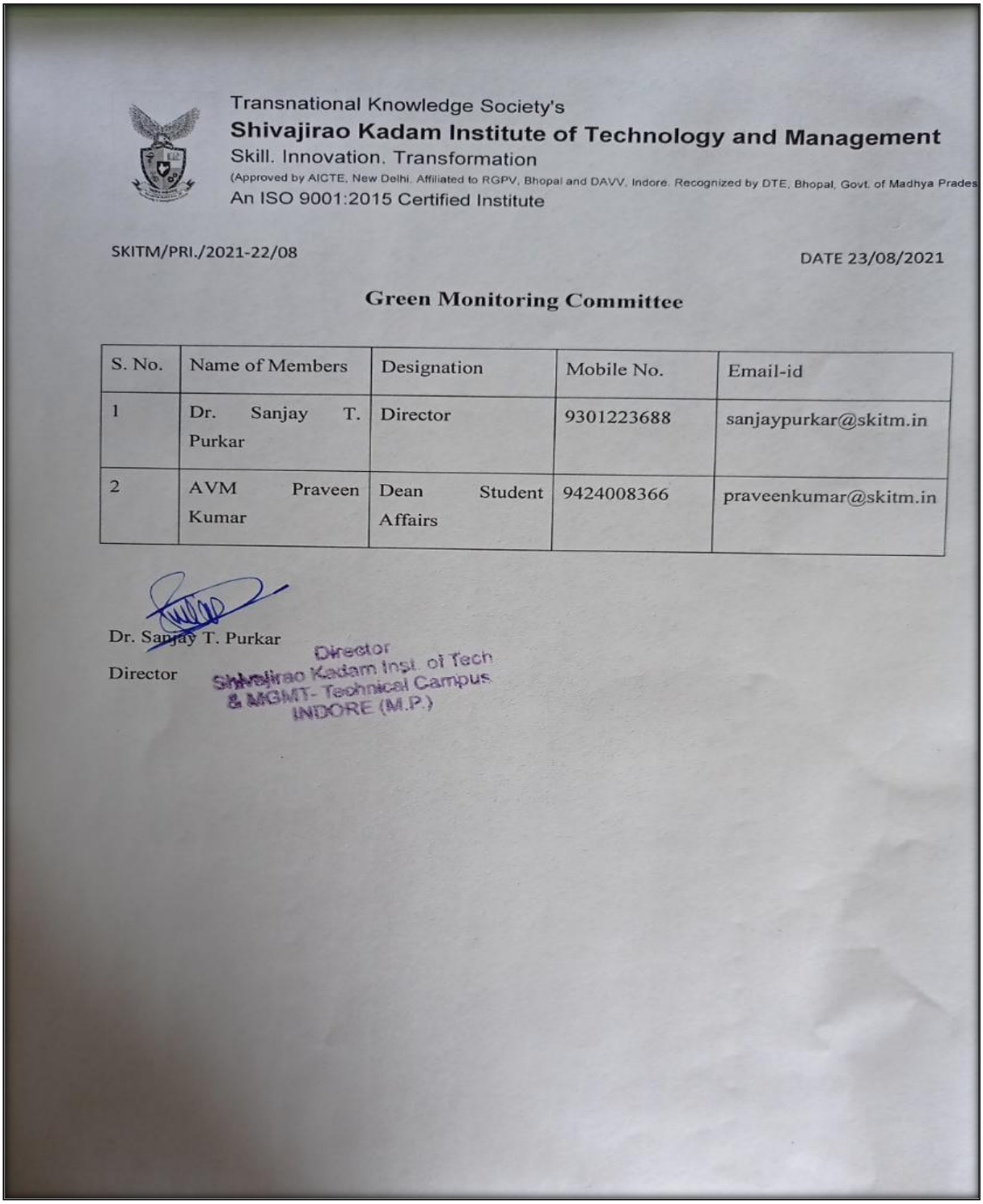
On cancellation, the certificate of accreditation shall be surrendered to the Bureau within fifteen days from the date of receipt of order of cancellation.

Your name has been entered at AEA No. 284 in the register of list of accredited energy auditors. Your name shall be liable to be struck out on the grounds specified in regulation 8 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

Given under the seal of the Bureau of Energy Efficiency, Ministry of Power, this 5th day of October, 2018

Secretary,
Bureau of Energy Efficiency
New Delhi

Green Monitoring Committee



Transnational Knowledge Society's
Shivajirao Kadam Institute of Technology and Management
Skill. Innovation. Transformation
(Approved by AICTE, New Delhi. Affiliated to RGPV, Bhopal and DAVV, Indore. Recognized by DTE, Bhopal, Govt. of Madhya Prades
An ISO 9001:2015 Certified Institute

SKITM/PRI./2021-22/08 DATE 23/08/2021

Green Monitoring Committee

S. No.	Name of Members	Designation	Mobile No.	Email-id
1	Dr. Sanjay T. Purkar	Director	9301223688	sanjaypurkar@skitm.in
2	AVM Praveen Kumar	Dean Student Affairs	9424008366	praveenkumar@skitm.in

Dr. Sanjay T. Purkar
Director

Director
Shivajirao Kadam Inst. of Tech
& MGMT- Technical Campus
INDORE (M.P.)

Audit Team

The study team constituted of the following senior technical executives from **Empirical Exergy Private Limited,**

- **Mr. Rakesh Pathak**, [Director & Electrical Expert]
- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **Mrs. Laxmi Raikwar Singadiya** [Energy & Chemical Engineer]
- **Mr. Sachin Kumawat** [Sr. Project Engineer]
- **Mr. Ajay Nahra** [Engineer]
- **Mr. Charchit Pathak** [Mechanical Engineer]
- **Mr. Aakash Kumawat** [Assistant Jr. Engineer]

EXECUTIVE SUMMARY

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures and other recommendation during the project that can be implemented in a phased manner to conserve energy, increase productivity inside the institute campus.

RECOMMENDATION: -

SOLAR SYSTEM

There is good potential to install 52.80 kWp roof top grid connected solar system. Expected annual solar energy generation @ 4 unit per kilowatt is 7708 units.

LIGHTING SYSTEM

Institute has already initiated installation of energy efficient lighting in building and replacement of "conventional tube light by energy efficient LED tube light. Still there are good potential for replacement of 429 no. of conventional T-12 (54Watt)" tube light by energy efficient 20Watt LED lighting in institute estimated energy saving potential is 29,172 kWh/Year.

Ceiling Fan AND Exhaust Fan

Replacement of "conventional ceiling fan (75 Watt)" by energy efficient star rated fan or BLDC based energy efficient fan (28 Watt) in class rooms, laboratories and faculties cabin" have great potential for energy saving.

TIMER CONTROLLED STREET LIGHTS

Installation of "Timer control on street lighting" in institute campus is recommended.

ENERGY MANAGEMENT WORKSHOP AND TRAINING

Conduct awareness, training programs, seminars, workshops, exhibitions for faculty, management and nonteaching staff.

ENERGY CONSERVATION MEASURES FOR ELECTRICAL SYSTEM

Case Study	Section	Identification	Observation	Recommendation	Annual Energy Saving (kWh)	Annual Cost Saving (Rs.)	Investment (Rs.)	Simple Payback Period
1	Lighting System	429 No. FTL tube light	Power consumption by T-12 FTL	Replacement of conventional (T-12) with (20 Watt LED Tube)	29,172	2,78,417/-	90,090/-	4 month
2	Ceiling Fan	31 No. Ceiling Fan	Power consumption by existing ceiling fan (75 Watt)	Replacement of 75W conventional ceiling fan by 28W BLDC	33,216	3,17014/-	8,71,920/-	2.8 Year
3	Electrical System	There is good potential for solar	100 percent energy consumption from grid	Installation of 52.80 KWp solar system	15,2445	7,70,880/-	23,76,000	3.1 year

CHAPTER-1
INTRODUCTION

1.1 About Institute

Shivajirao Kadam Institute of Technology and Management (SKITM) was founded in the year 2019, with its first intake as SKITM in 2020, after taking over the Erstwhile Acropolis Technical Campus. SKITM is under the aegis of Transnational Knowledge Society, which was founded in the year 2008. Under the visionary leadership of renowned academician Prof. Shivajirao Kadam, the institution aims to transform the lives of its students and establish itself as the center of excellence in the state of Madhya Pradesh. The institute works on three key principles – Skill, Innovate and Transform. Our unique methodology distinguishes us from the rest of the institutions. We are highly focused on practical aspects of education, we aim to make our students ready to take up the real world challenges which the industry poses at them. We currently have 4 schools which offer B.TECH (CSE, MECH, CIVIL, EC), B.COM, BBA, Integrated BBA-MBA, B.Pharma, MBA as well as Diploma in Mechanical, Civil and Pharmacy. With the unrivalled leadership and the guidance of our Mentors, SKITM is changing the design and nature of education. SKITM will be recognized for the impact its teachings will have on its students and the community at large. Our Extensive Training Sessions, Unique Teaching Methodology, Strong Collaborations, Impactful Certifications and Partnerships make us the up and coming institute in Central India.

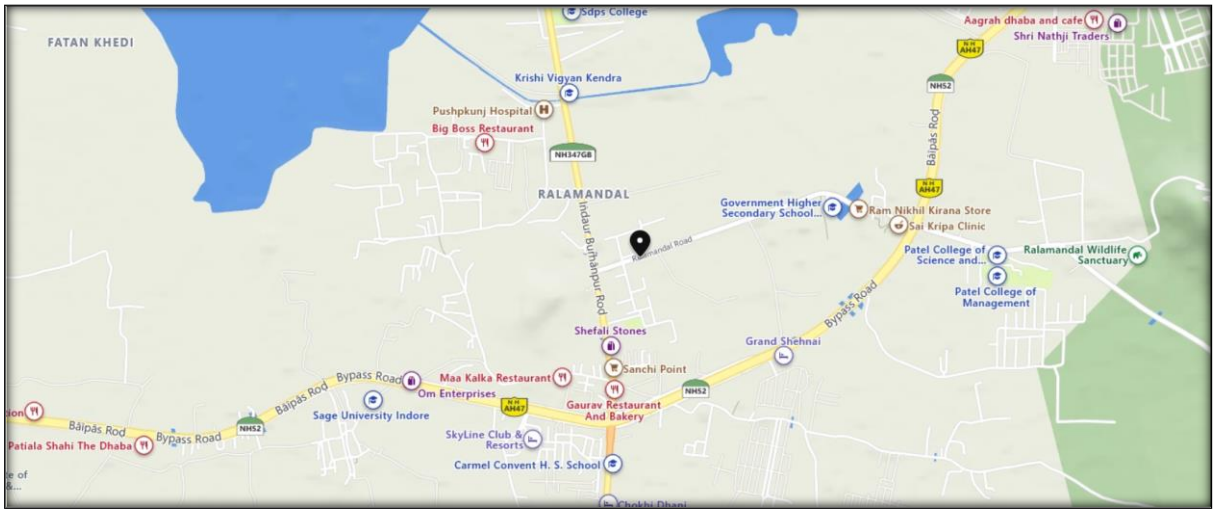


Figure - 1.1 Satellite image of SKITS Institute (Source – Google)

Vision

Holistic development of the learner through excellence in education, innovation & research.

Mission

1. To create competitive and technically empowered environment which enable students to develop and discover their potential and become competent to address industrial, societal and global challenges.
2. To achieve academic excellence in application-oriented research, novelty and creativity leading to emergence of technocrats, leaders, innovators and renowned entrepreneurs.
3. To become a top school in country where students are raised with Holistic learning for inculcating core values of professionalism, gender equality, transparency and ethics.
4. To establish partnership with globally recognized institutions and organizations to foster students with industrial exposure through extensive hands-on training.
5. To ensure overall nurturing and all-round personality development of students by continues monitoring and guidance.

1.2 About Energy Audit

Energy audit helps to understand more about the ways energy is used in any plant and helps in identifying areas where waste may occur and scope for improvement exists. The overall energy efficiency from generation to final consumer becomes 50%.

Energy audit is the most efficient way to identify the strength and weakness of energy management practices and to find a way to solve problems. Energy audit is a professional approach in utilizing economic, financial, and social and natural resources responsibility. Energy audits "adds value" to management control and is a way of evaluating the system.

Empirical Exergy Private Limited (EEPL), Indore M.P. carried out the "Energy Audit" at the site to find gaps in the energy consumption pattern for **Shivajirao Kadam Institute of Technology & Management** technical report is prepared as per the need and the requirement of the project.

1.3 Objectives of Energy Audit

An energy audit provides vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas of thermal and electrical energy economy.
- Highlighting wastage in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.

1.4 Methodology

Methodology adopted for achieving the desired objectives viz.: Assessment of the current operational status and energy savings include the following:

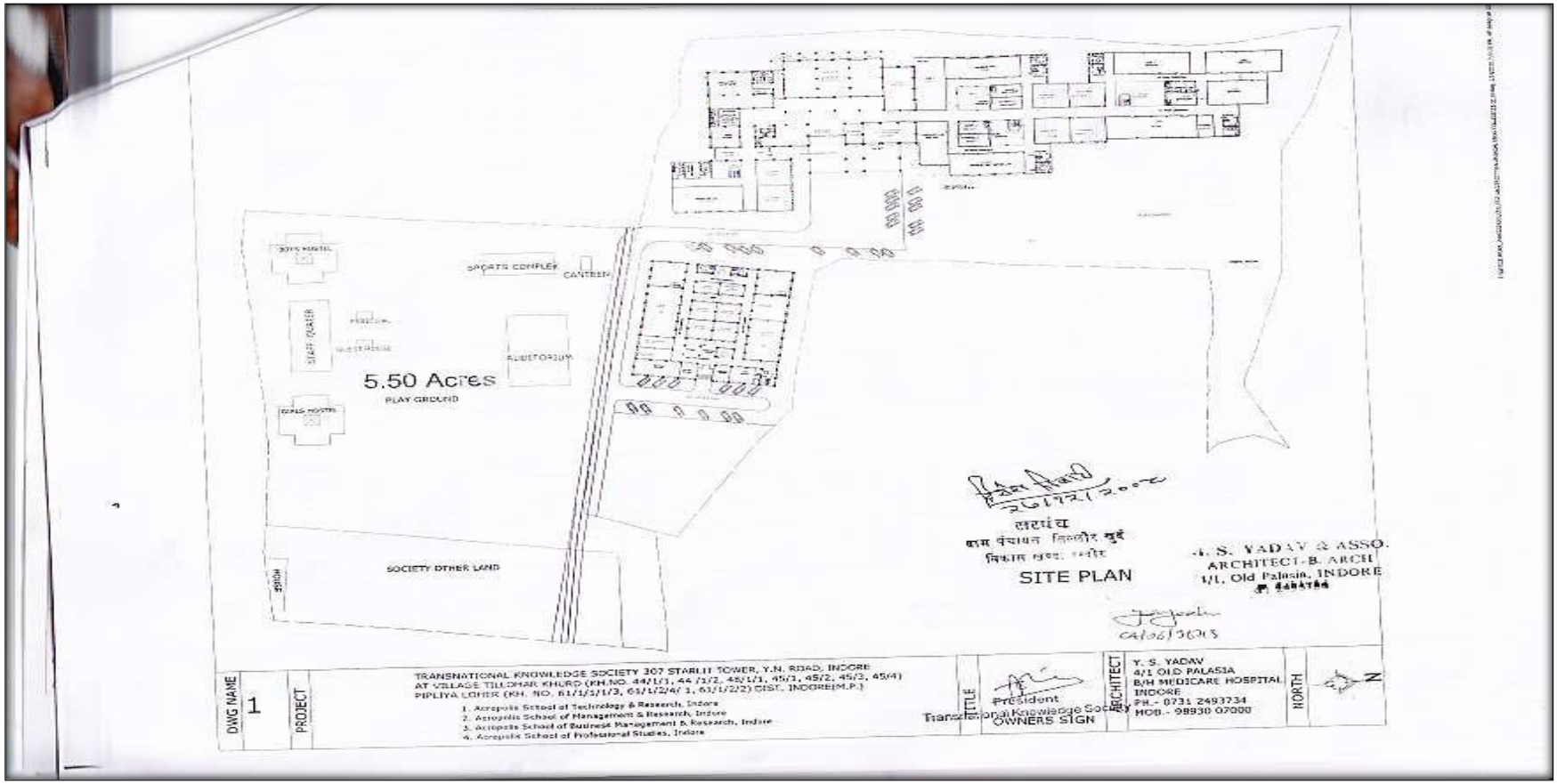
- Discussions with the concerned officials for identification of major areas of focus and other related systems.
- Team of engineers visited the site and had discussions with the concerned officials / supervisors to collected data / information on the operations and load distribution within the plant and same for the overall premises. The data was analyzed to arrive at a base line energy consumption pattern.
- Measurements and monitoring with the help of appropriate instruments including continuous and / or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- Trend analysis of costs and consumptions.
- Capacity and efficiency test of major utility equipment's, wherever applicable.
- Estimation of various losses
- Computation and **in-depth analysis** of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plan/s for improvements/ reduction in specific energy consumption.

1.5 Present Energy Scenario

Institute uses energy in the form of electricity purchased from MPPKVVCL grid. The institute has non industrial 33KV feeder with contract demand 100 KVA. As per applicable tariff HV-3.2.B non-industrial 33KV feeder fixed charges is Rs. 485/- per KVA and energy charges Rs. 7.38 per unit.

Total billing amount of Shivajirao Kadam Institute of Technology & Management of institute is INR 17,75,029/- with respect to annual energy consumption 1,52,445unit analysis period from Jul-2021 to Jun-2022. Annual average per unit charges paid by institute is Rs.11.93 per unit.

Institute Layout



CHAPTER-02
POWER SUPPLY SYSTEM

2.1 Power Supply System

The power supply for the Shivajirao Kadam Institute of Technology & Management from MPPKVVCL with the help of 33 kV feeder under tariff HV-3.2.B Non-Industrial. There is single transformer has capacity 200 KVA. Detail of the transformer is given in table 2.1

Sr. No.	Items	Technical specification	Unit
1	Make	Sterling	
2	Year	2010	
3	Rating	200	KVA
4	Voltage (HV/LV)	33000/433	V
5	Current (HV/LV)	3.5/266.67	Amp
6	Frequency	50	Hz
7	Impedance	4	%
8	Vector Group	Dyn11	
9	Type of cooling	ONAN	
10	Total no. of Tap	5	No.
11	Ideal Tap Position	3	

2.2 Loading of transformer: The load of the transformer is calculated based on maximum demand appear in electricity bill.

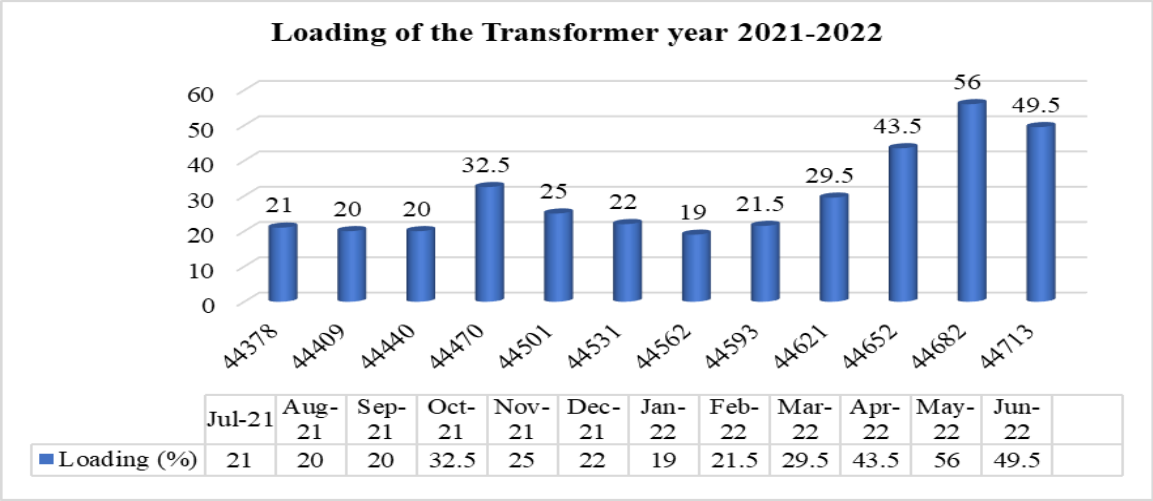


Figure 2.3:- Graphical presentation of TR loading percentage Year 2021-22

Observation: - The average loading of the transformer is 30%. It is acceptable.

2.3 DG Set

There is DG set in institute campus. Detailed of the DG set are given table

Table 2.2 Technical specifications for DG set

Sr. No.	Parameter	Technical specification	Units
1	Make	Stanford	
2	M/C No	N156278738	
3	Capacity	160	KVA
4	Rated Voltage	415	Volt
5	Full load current	222.6	Amp.
6	Frequency	50	Hz.
7	Power factor	0.8	
8	Speed	1500	RPM
9	Phase	3	

Figure 2.4: - DG set in Institute

Observation :

- DG set is used only in case of grid power failure.
- There is no system to monitor fuel consumption w.r.t. unit generation.
- It is suggested to maintain logbook for unit generation and fuel consumption of DG set.

CHAPTER- 3
ELECTRICITY BILL ANALYSIS

3.1 Monthly Electrical Energy Consumption (Year 2021-22)

The monthly unit consumption given in table.

Table 3.1 Energy consumption and billing amount (the year 2021-22)

Sr. No.	Month & Year	Unit consumption (kWh/Month)	Total Amount (Rs /Month)	Overall Unit Charges (Rs/kWh)
1	Jul-21	6,732	94,687/-	14.07
2	Aug-21	7,554	1,01,359/-	13.42
3	Sep-21	10,881	1,27,408/-	11.71
4	Oct-21	13,236	1,43,991/-	10.88
5	Nov-21	11,937	1,30,991/-	10.97
6	Dec-21	11,361	1,27,480/-	11.22
7	Jan-22	11,622	1,32,469/-	11.40
8	Feb-22	11,991	1,99,777/-	16.66
9	Mar-22	12,609	1,38,449/-	10.98
10	Apr-22	16,257	1,72,065/-	10.58
11	May-22	19,281	2,09,005/-	10.84
12	Jun-22	18,984	1,97,348/-	10.40
	Total	**1,52,445**	**17,75,029/-**	**11.93**

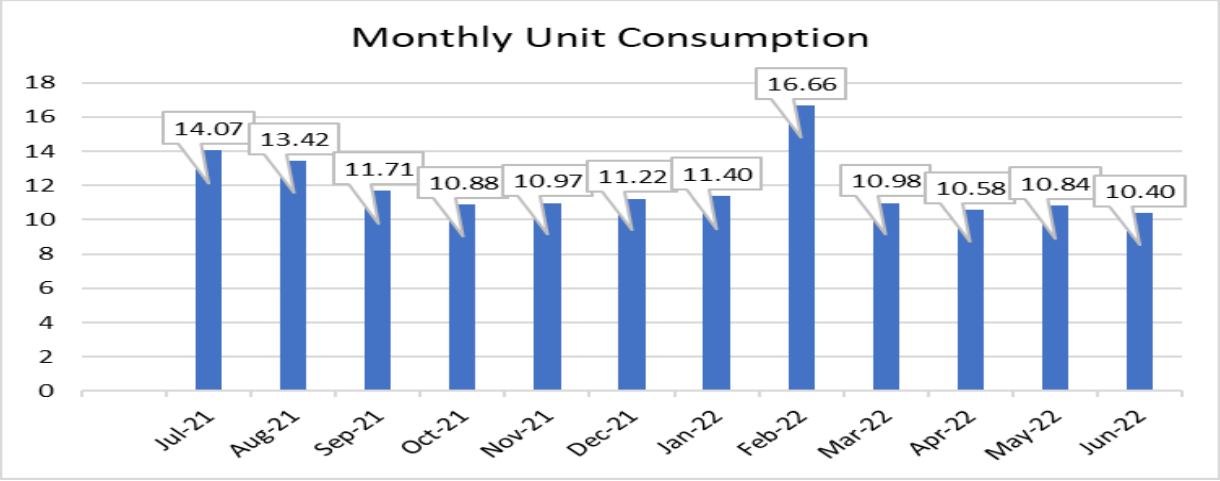


Figure 3.1: - Monthly Unit Consumption year-2021-22

Observation - Annual energy consumption is 1,52,445 units and overall per unit charges is Rs.11.93 per unit.

3.2 Monthly demand analysis (Year 2021-22).

The monthly demand consumption for the institute is given in the table.

Table 3.2: - Monthly demand analysis (KVA) consumption pattern year 2021-22

Sr. No.	Month& Year	Contract Demand (kVA)	Maximum Demand(kVA)	Billing Demand (kVA)
1	Jul-21	100	42	90
2	Aug-21	100	40	90
3	Sep-21	100	40	90
4	Oct-21	100	65	90
5	Nov-21	100	50	90
6	Dec-21	100	44	90
7	Jan-22	100	38	90
8	Feb-22	100	43	90
9	Mar-22	100	59	90
10	Apr-22	100	87	90
11	May-22	100	112	112
12	Jun-22	100	99	99

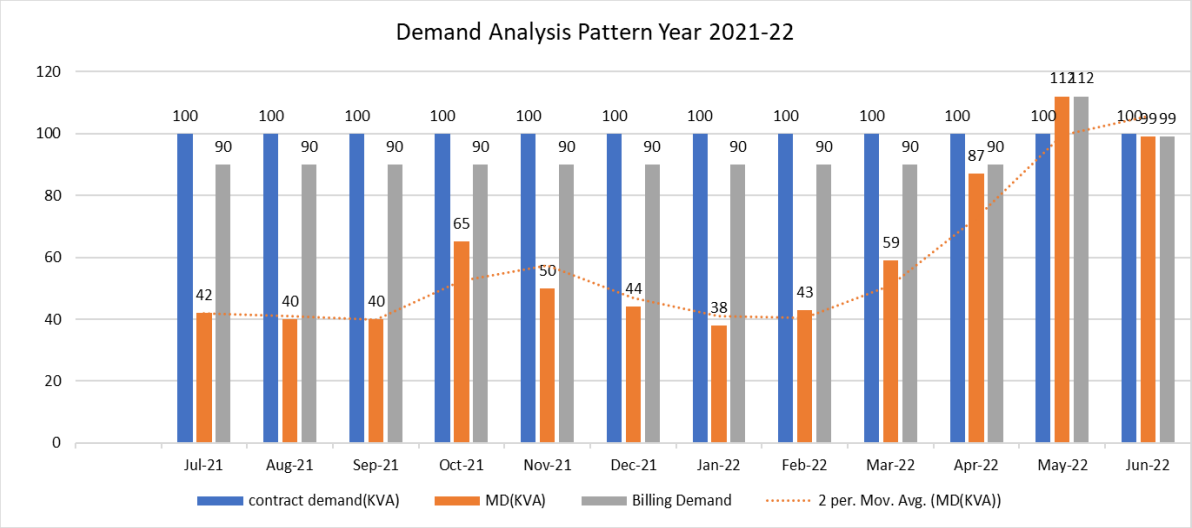


Figure 3.2:- Graphical presentation of demand consumption year-2021-22

Observation – Maximum demand is always less than billing demand from July 2021 April 2022 in the month of May 2022 and Jun-2022 maximum demand is equal to billing demand due to cooling load of the institute

3.3 Monthly Power factor analysis (Year 2021-22)

The monthly power factor for the institute is given in the following table.

Table 3.3:- Power factor of the institute year 2021-22.

Sr. No	Month & Year	Monthly Power Factor	Inventive Percentage (%)	Incentives Amount (Rs. / Month)
1	Jul-21	0.952	1	475/-
2	Aug-21	0.954	1	533/-
3	Sep-21	0.956	1	767/-
4	Oct-21	0.986	5	4,752/-
5	Nov-21	0.985	5	4,552/-
6	Dec-21	0.989	5	4,079/-
7	Jan-22	0.988	5	4,254/-
8	Feb-22	0.986	5	4,389/-
9	Mar-22	0.984	5	4,615/-
10	Apr-22	0.988	5	5,997/-
11	May-22	0.989	5	7,173/-
12	Jun-22	0.990	5	7,062/-
			4	48,645/-

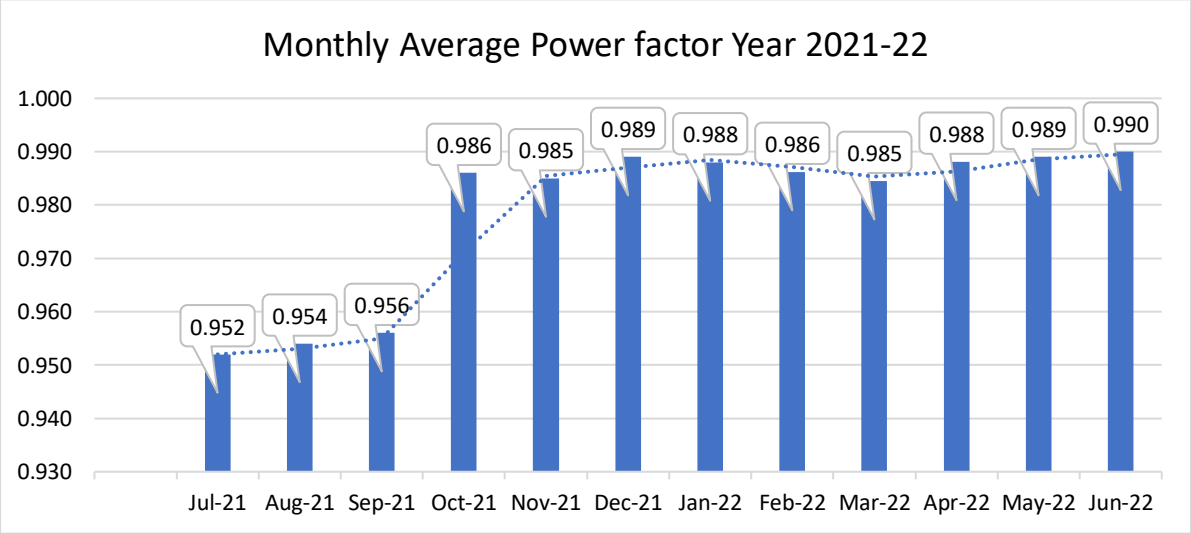


Figure 3.2: - Graphical presentation of demand consumption year-2021-22

Observation – Monthly Average Power Factor is 0.979 and Annual P.F. incentive is taken Rs.48,645/- It's appreciable.

3.4 Monthly Peak and off. Peak period unit consumption analysis year 2021-22

The monthly Peak period and Off. Peak Period consumption for the institute is given in the following table.

Table 3.4:- Peak Period and Off. Peak Period of the institute year 2021-22.

Sr. No.	Month& Year	Total Unit	Peak Period Unit	Off. Peak Period	Normal Period Time
1	Jul-21	1267	942	2436	6044
2	Aug-21	1295	1263	2430	5623
3	Sep-21	1392	1851	2649	5904
4	Oct-21	1592	1944	2754	6148
5	Nov-21	1725	1790	2877	5799
6	Dec-21	1584	1857	2610	5337
7	Jan-22	1524	1938	2406	5397
8	Feb-22	1767	2049	2487	5829
9	Mar-22	1677	1992	2469	6834
10	Apr-22	1770	2010	2580	5328
11	May-22	1656	2286	2454	3504
12	Jun-22	1119	2196	1623	2442
	Total				

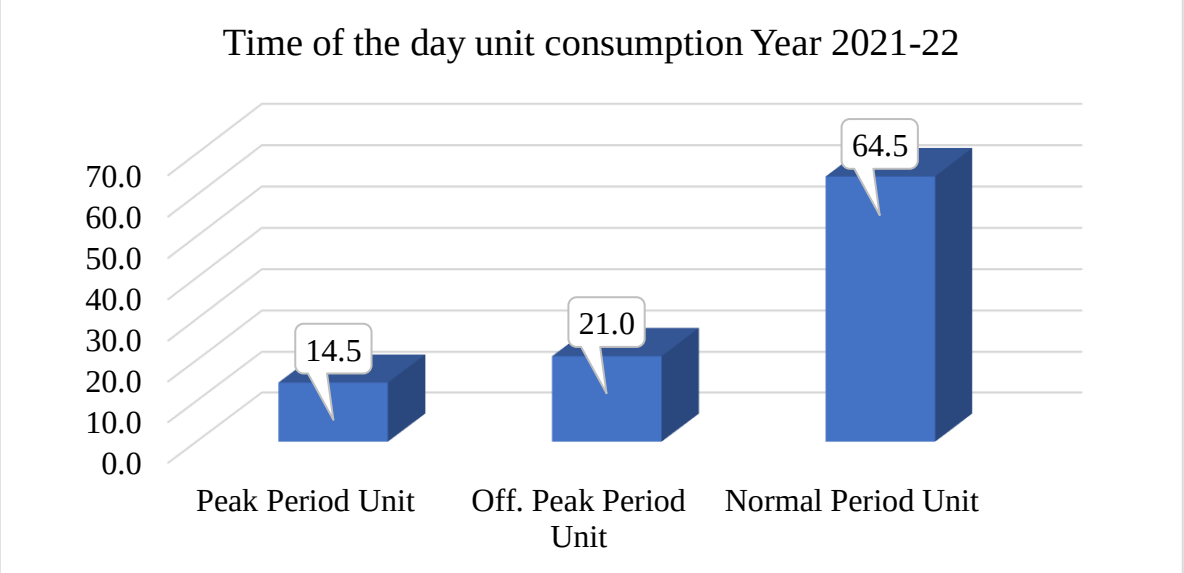


Figure 3.1: - Time of the day unit consumption year-2021-22

Observation-The Average Peak Period Unit 14.5%, Off. Peak Period Unit 21%, Normal Period Unit 64.5% for the year 2021-22.

3.5 Monthly Average Load Factor analysis (Year 2021-22)

The monthly Avg. Load Factor for the institute is given in the following table.

Table 3.4:- Avg. Load Factor of the institute year 2021-22.

Sr. No.	Month & Year	Avg. Load factor (%)
1	Jul-21	7.00
2	Aug-21	9.00
3	Sep-21	10.00
4	Oct-21	15.00
5	Nov-21	15.00
6	Dec-21	15.00
7	Jan-22	15.00
8	Feb-22	16.00
9	Mar-22	19.00
10	Apr-22	22.00
11	May-22	24.00
12	Jun-22	25.00

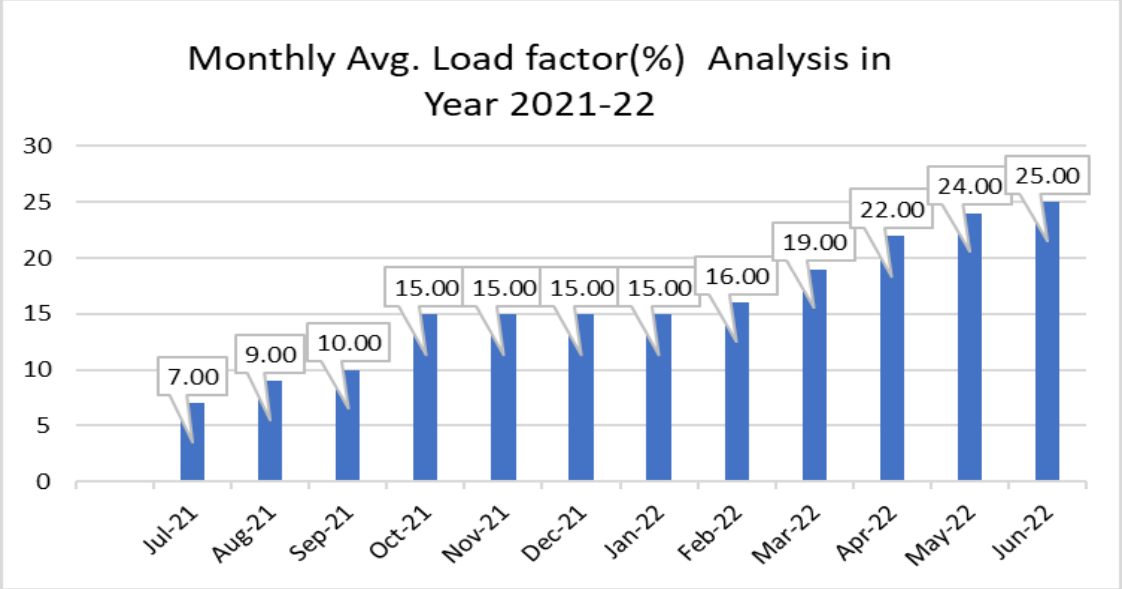


Figure 3.1: - Monthly Avg. Load Factor year-2021-22

Observation - Annual Avg. Load Factor is 16%

3.6 Connected Load details of institute

M.E. Department					
Sr. No.	**Location**	**Fan**	**Tube light**	**PC**	**CFL**
1	118E lab M.D.	5	5	1	0
2	117A Thermal lab	4	6	0	0
3	117B TOM DOM lab	5	7	1	0
4	118A Metopology lab	3	3	0	0
5	118B FM lab	5	4	1	0
6	118C H.M.T(Vibious)	5	5	2	0
7	118D RAC lab	5	5	2	0
8	106A M.M.C lab	4	7	4	0
9	107A CAD lab	7	4	26	0
10	108 Class Room	6	4	0	0
11	109 Class Room	6	4	0	0
12	116C Class Room	4	4	0	0
13	112B HOD Room	1	1	1	0
14	112D	1	1	0	0
15	Toilet	0	1	0	0
15	112C Office ME.	1	1	3	0
6	115 Class Room	6	6	0	0
17	Workshop 005	12	4	0	7
18	005A.B.ICE Auto machine	5	8	0	0
19	Outside Room	4	16	0	0
		85	76	41	7

E.C.E Department							
Sr. No.	**Location**	**Fan**	**Tube light**	**PC**	**Printer**	**Cooler**	**LED**
1	Room No. 202	5	6	4	0	0	0
2	Room No. 201	6	4	0	0	0	0
3	Room No. 203	4	2	0	0	0	0
4	Room No.105A	7	5	10	0	0	0
5	Room No.105C	4	4	0	0	0	0
6	Room No.105D	4	4	5	0	0	0
7	Room No.105E	7	7	0	0	0	0
8	Room No.105F	6	6	8	0	0	0
9	Room No.104	2	2	0	2	3	0
10	Ground floor	5	27	0	0	0	0
11	Ground floor	0	0	0	0	0	6
12	Ground floor	0	0	0	0	0	8

C.S.E Department					
Sr. No.	**Location**	**Fan**	**Tube light**	**PC**	**A.C.**
1	Lab 205A	7	5	8	0
2	Lab 205B	7	5	30	0
3	Lab. N	2	2	8	0
4	C.O	12	8	60	0
5	205E	7	4	30	0
6	205A	7	4	30	0
7	206B	9	6	60	0
8	RAG	2	2	6	0
9	222	6	6	0	0
10	221	4	4	0	0
11	217A	3	3	0	0
12	206D	2	2	8	0
13	Toilet	0	1	0	0
14	Excon Room	4	4	3	0
15	214	4	4	0	0
16	207A	3	2	2	1
17	207B	6	4	0	0
18	20A	4	4	0	0
19	20B	4	4	0	0
20	216	4	4	0	0
21	215	6	6	60	0
22	208	4	4	0	0
23	209	4	4	0	0
24	210	4	4	0	0
25	211	4	4	0	0
26	cabin	24	24	0	0
27	C.S Office	1	2	0	0
28	C.S HOD	1	1	0	1
29	HOD	1	1	0	0
30	HOD	1	1	0	0
31	HOD	5	5	0	0
32	Second floor Outside room	0	6	0	0
33	Third floor	0	7	0	0

Pharmacy Building							
Sr. No.	Location	Fan	Tube light	PC	Printer	A.C.	Projector
1	Class Room 1	9	12	0	0	0	1
2	Class Room 2	9	11	0	0	0	0
3	Class Room 3	9	12	0	0	0	0
4	Class Room 5	4	7	0	0	0	0
5	Principle Office	4	4	1	1	1	0
6	Computer lab	6	7	22	0	1	0
7	Machine Room II	5	8	0	0	0	0
8	Office	3	4	2	0	0	0
9	Faculty Room II	5	7	5	0	0	0
10	Faculty Room I	5	5	3	0	0	0
11	Machine Room I	5	8	0	0	0	0
12	Central Stair	0	0	0	0	0	0
13	Pharmaceutical Lab III	6	2	0	0	0	0
14	Analysis Lab	6	5	0	0	0	0
15	Instrument Room	4	12	2	0	1	0
16	Pharmacognosy Lab II	6	2	0	0	0	0
17	Microbiology Lab	5	4	0	0	0	0
18	Pharmacognosy Lab I	5	4	0	0	0	0
19	HAP Lab	5	8	0	0	0	0
20	Chemistry lab III	3	6	0	0	0	0
21	Class Room VI	0	8	0	0	0	0
22	Chemistry Lab I	7	5	0	0	0	0
23	Chemistry Lab II	3	6	0	0	0	0
24	Ceutics Lab I	4	5	0	0	0	0
25	Ceutics Lab I	7	6	0	0	0	0
26	Ream	2	2	0	1	0	0
27	GCR	0	1	1	0	0	0
28	Class RoomIV	9	11	0	0	0	0
29	Cognecy	4	5	0	0	0	0
30	Exam	0	0	0	1	0	0
31	Exam	2	2	1	1	0	0
32	GCR	0	1	0	0	0	0
33	Class Room IV	0	0	0	0	0	0
34	Cognosy III	0	0	0	0	0	0
35	Washroom	0	3	0	0	1	0
36	Lobby Area	1	20	0	0	0	0

MBA						
Sr. No.	Location/RoomNo.	Fan	Tube light/ Ceiling Light	PC	AC	Street light
1	012B	1	1	1	0	0
2	012C	2	3	5	0	0
3	015	6	15	0	2	0
4	011 Class Room	5	4	0	0	0
5	010 Class Room	6	4	0	0	0
6	111 Class Room	6	4	0	0	0
7	110 Class Room	6	4	0	0	0
8	115A	4	4	5	0	0
9	012A Director Sir	1	1	1	1	0
10	Outside institute building	0	0	0	0	20

Civil Department						
Sr. No.	Location/RoomNo.	Fan	Tube light	PC	Printer	Wall fan
1	014 B (Office)	2	5	2	2	0
2	017A Lab	10	8	1	0	0
3	016 A	8	14	1	0	0
4	016B	7	13	2	0	0
5	017 B	3	4	0	0	0
6	018 A	5	3	2	0	0
7	018 B	5	5	1	0	0
8	116 A	5	4	0	0	0
9	116 B	3	4	0	0	0
10	Reception	0	0	0	0	1

Canteen	
Fan	Tube light
19	19

3.7 Connected Load sharing Electrical Equipment

Table-3.7 Total load share of electrical equipment in institute.

Sr. No.	Equipment's	Unit Power (watt)	Quantity	Total Power (Watt)	Load share%
1	Tube light	54	429	23166	17.70
2	LED Tube (20 watt)	20	6	120	0.09
3	Ceiling fan	60	519	31140	26.70
4	Computer	75	431	32325	24.70
5	Printer	320	8	2560	1.96
6	Split A.C.	1450	9	13050	9.97
7	Wall Fan	60	1	60	0.05
8	Street light Metal Halide	400	3	1200	0.92
9	Street light LED	200	7	1400	1.07
10	Lift	4000	1	4000	3.06
11	Air Cooler	150	3	450	0.34
12	CFL	15	7	105	0.08
13	Ceiling light LED	12	8	96	0.07
14	Bore -1 behind Engg. Block	3730	1	3730	2.85
15	Bore-2 Near Pharmacy block	3730	1	3730	2.85
16	Bore -3 Near CPS Block	3730	1	3730	2.85
17	Bore-4 Near Garden	2238	1	2238	1.71
	Total			130885	100.00

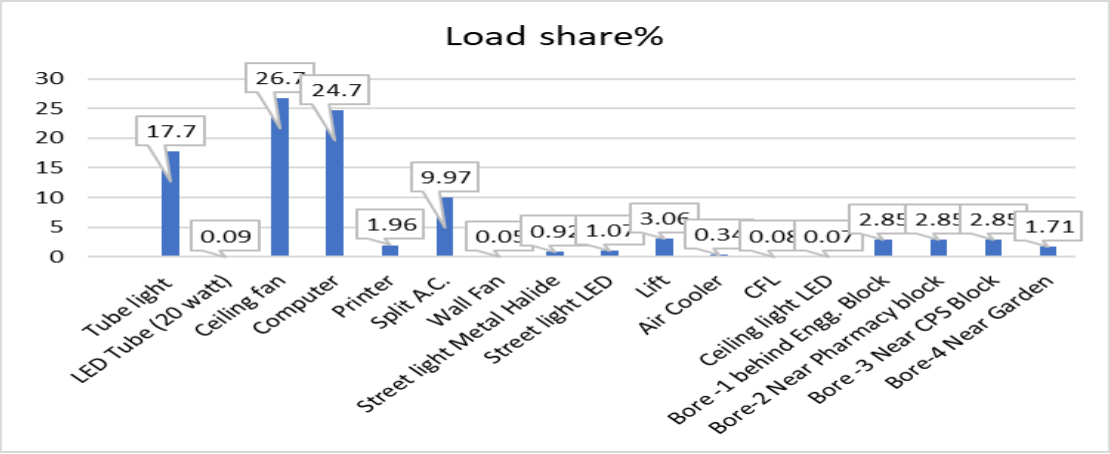


Figure 3.6 Connected load in sharing on Electrical appliance

3.6 Some Photograph of Electrical Equipment's: -

CHAPTER- 4

ENERGY CONSERVATION MEASURES

4.1 Case Study

Replacement of conventional (tube light) 54 Watt by energy efficient 20 Watt LED tube light

Sr. No.	Items	Parameters	Units
1	Total Power Consumption by T-12 conventional tube light	54	Watt
2	No. of T-12	429	Nos.
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	250	Days/Year
5	Rated Power of Energy Efficient T-5 (LED)	20	W
6	Energy Saving Potential	29,172	kWh/Year
7	Load Factor	0.8	
8	Expected Annual Energy Saving	23,337/-	kWh/Year
9	Overall, Per Unit Charges	11.93	Rs./kWh
10	Expected Money Saving	27,8417/-	Rs./Year
11	Cost of T-5	200/-	Rs./ Pices
12	Investment on New Light Purchasing	85,800/-	Rs.
13	Maintenance Investment@5%	4,290/-	Rs.
14	Total Investment	90,090/-	Rs.
15	Simple Pay Back Period	4	Month

4.2 Case Study

Replacement of 60W conventional ceiling fan by 28W BLDC Energy efficient ceiling fan in institute: -

Sr. No.	Item	Parameter	Unit
1	Rated Power of Ceiling Fan	60	W
2	No. of Fan	519	Nos
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	250	Days/Year
5	Energy Efficient BLDC Fan Rated power	28	W
6	Energy Saving Potential	33,216	kWh/Year
7	Load Factor	0.8	
8	Expected Annual Energy Saving	26,572.8	kWh/Year
9	Per Unit Charges	11.93/-	Rs/kWh
10	Expected Money Saving	3,17,014/-	Rs./Year
11	Cost of New Celling Fan	1,600/-	Rs./Pisces
12	Investment on New Fan Purchasing	8,30,400/-	Rs.
13	Maintenance Investment@5%	41,520/-	Rs.
14	Total Investment	8,71,920/-	Rs.
15	Simple Pay Back Period	2.8	Year

Total Calculated Monetary Saving Potential in Celling Fan = Rs 3,17,014 /-

Note: - Energy saving depends on the operation hour per day and load factorof the systems.

4.3 Case Study

Installation 52.80 kWp grid connected solar roof top system

Solar unit (Energy) Generation calculation: -

Theoretical capacity calculation of solar plant on Transformer Capacity			
1	Existing Transformer Capacity	200	KVA
2	Maximum theoretical limit as per Net Meting policy of electricity board	33	%
3	Maximum theoretical Potential limit of solar plant as per the transformer capacity	66	KVA
4	Power Factor of the Electrical System	0.8	
5	Theoretical solar plant capacity as per transformer Capacity	52.80	KWp
6	Expected Solar Unit generation @4 unit/day/KWp	211.2	kWh/Day
7	Expected Annual Solar Unit generation of the Solar Plant	77,088	KWh/Year
8	Annual Unit consumption of institute (Year 2021-22)	15,2445	kWh/Year
9	Normal energy consumption of the institute in Day Time	64.5	%
10	Normal energy consumption of the institute in Day Time	98,327	kWh/Year

Analysis: As per the theoretical calculation of solar plant capacity based on transformer rated capacity is 52.80 kWp and expected annual unit generation of solar plant is 72270 units w.r.t annual energy consumption of the institute in day time is 982327 units. it is justified recommended the solar plant capacity 52.80kwp is accepted.

Payback Period Calculation		
Total solar unit generation of the system (52.80 kwp)	77,088	kWh/ year
Overall Energy Charges per Unit as per electricity bill	10	
Expected revenue generation	7,70,880/-	Rs./year
Expected cost of 1kw solar plant @50Rs.perwatt	45,000/-	Rs./kwp
Expected total investment	23,76,000/-	Rs.
Simple payback period of the project	3.1	year

End of The Report

Thank you