DETAILED ENERGY AUDIT REPORT

Shri Shivaji Arts & Commerce College,

Amravati-444603, Maharashtra

August-2021

Conducted By

PPS Energy Solutions Pvt. Ltd.

Engineering Consultants

Plot No-18, Girish Housing Society

Warje, Pune – 411058, Maharashtra, India

PPS ENERGY SOLUTIONS PVT. LTD. PPS

Dr. Ravi G. Deshmukh

Energy Auditor Class - A

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

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

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ECN/2021-22/CR-28/3412

06th July, 2021

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with *MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)* under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s PPS Energy Solutions Pvt. Ltd.
B-403, Bharat Vihar, S.No-78,
Bharti Vidyapith, Campus,
Katraj, Pune-411043.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : *MEDA/ECN/2021-22/Class A/EA-11*

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **05th July, 2023** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (TC)

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 audit is a mare mile marker towards destination of achieving safe, healthy and energy efficient unit. We would like to emphasize that an electrical 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 building 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 building or premises 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 building or premises, then follows with reviewing and analyzing the condition and performance of various building services installations and building management, with an aim at identifying areas of inefficiency and suggesting means for improvement.

Through implementation of the suggested improvement measures, building owners can get the immediate benefit for paying less for energy bills. On the other hand, lowering of energy consumption in buildings will lead to the chain effect that less fossil fuel will be burnt for electricity generation by the power supply companies 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 Shri Shivaji Arts & Commerce College, Amravati for entrusting and offering the opportunity. It is our immense pleasure to present the detailed report on energy assessment.

We acknowledge the support from management for their positive support in undertaking the task of energy efficiency assessment of all electrical system, thermal systems, utilities and other area and for continuous help and support before and during the 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 Shri Shivaji Arts & Commerce College, Amravati for entrusting PPS Energy Solutions Pvt. Ltd.

For PPS Energy Solutions Pvt. Ltd.

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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

1. EXECUTIVE SUMMARY

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

The building visit was conducted by energy audit team. The site visit included interaction with staff, electricians of building, the collection/review of further data and a field inspection of the facilities and equipment.
The salient observations and recommendations are given below.

1. The Total Cost of Energy is around **Rs. 2,76,617**/- per Annum
2. Average monthly units consumed are **14,291 kWh** equivalent to **Rs. 23,051**/-
3. Average electricity charges works out to be **Rs. 5.6**/-

This brief report has therefore sought to provide a high-level overview of the status of energy efficiency at building, 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.	ECM Details	Investment (Rs. In Lacs)	Savings (kWh/year)	Carbon credit (Tons of Co2)	Saving (Rs.In Lacs /Year)	Payback (Years)
1	Optimize the temperature setting to 23-25 degree Celsius	0.00	317.52	0.28	0.02	0.00
2	Replacement of conventional lights with suitable LEDs	0.84	6446.88	5.48	0.36	2.34
3	Replacement of existing fans with energy efficient Super fans	1.94	5544.00	4.71	0.31	6.24
Total		**2.78**	**12308.40**	**10.48**	**0.69**	**4.03**

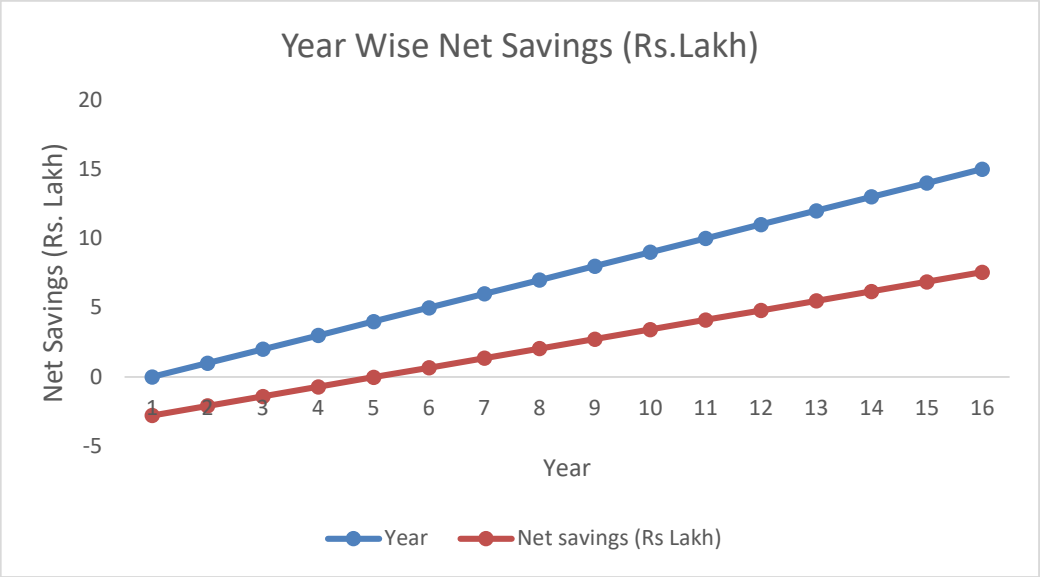
Note: Estimated savings may base on operating conditions

During the Energy Audit, Total Estimated Investment of Rs.2,78,060/- yields Total Estimated Savings of Rs. 68,927/- which 25 % of the Total Energy Cost of Rs. 2,76,617/- with an overall payback period of 4.03 years.

Other Recommendations:

A. Regular cleaning and maintenance of equipment's is important to reduce energy losses.
B. Use of start rated equipment's is also strongly recommended specially in case of Fans and Air conditioning.
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 students and staff is very essential step to reduce wastage of electricity
E. Energy conservation awareness programs can be conducted once a year. Increasing energy awareness of employees and students 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	-2.78	0.00	0.00	-2.78
1	0.00	0.69	0.69	-2.09
2	0.00	0.69	1.38	-1.40
3	0.00	0.69	2.07	-0.71
4	0.00	0.69	2.76	-0.02
5	0.00	0.69	3.45	0.67
6	0.00	0.69	4.14	1.36
7	0.00	0.69	4.82	2.04
8	0.00	0.69	5.51	2.73
9	0.00	0.69	6.20	3.42
10	0.00	0.69	6.89	4.11
11	0.00	0.69	7.58	4.80
12	0.00	0.69	8.27	5.49
13	0.00	0.69	8.96	6.18
14	0.00	0.69	9.65	6.87
15	0.00	0.69	10.34	7.56



Net Saving Graph (Rs. Lakh)

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

2. GENERAL AUDIT REVIEW

Building 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 among 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 inefficient.
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 building 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

The electricity supply for building is provided by Maharashtra State Electricity Distribution Company Limited (MSEDCL). Having eight energy meters & one energy meter. Billing is carried out according to LT VII(B)- Tariff & LT-II-Tariff Respectively

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
3) Air Conditioner

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

Table 1 Name of Building

Sr. No.	Name of the Building
1	History Dept
2	Marathi Dept
3	Mass. Comm. Building
4	Office
5	Staff Room
6	NAC Dept
7	Auditorium
8	Sociology Dept + Hall
9	Hall
10	Home Sci. Dept
11	Mukt Vid.
12	Boys Hostel
13	Mass Commu.
14	Gymnasium
15	Girls Hostel
16	Street Light
17	Library + Comp. Dept

4.1. Electricity Bill Analysis

1. Consumer Details of Meter No.366470077659

Consumer Details

Table 2 Consumer Details

Parameter	Details
Consumer No.	**366470077659**
Consumer Name	THE PRINCIPAL
Address	MORSHI ROAD AMRAVATI 444601
Pin Code	444601
Connected load (KW)	8
60% of con. Demand (KVA)	4.5
Sanctioned Load (KW)	7.5 Kw
Tariff	073/LT VII(B)
Bu/ Circle No	4295

Consumption Details

Table 3 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)
Jul-21	893	373	1232	4179	170	5955
Jun-21	951	373	1312	4451	181	6317
May-21	1080	373	1490	5054	206	7123
Apr-21	881	363	1286	4314	170	6133
Mar-21	792	362	1148	3849	151	5510
Feb-21	856	362	1241	4160	163	5926
Jan-21	716	362	1038	3480	65	4945
Dec-20	528	362	766	2566	101	3794
Nov-20	785	362	1138	3815	149	5465
Oct-20	881	362	1277	4282	168	6089
Sep-20	118	362	171	573	22	1129
Aug-20	3342	362	4744	16972	636	-80357
Avg	**985**	**365**	**1404**	**4808**	**182**	**-1831**
Max	**3342**	**373**	**4744**	**16972**	**636**	**7123**
Min	**118**	**362**	**171**	**573**	**22**	**-80357**
Sum	**11823**	**4378**	**16844**	**57696**	**2181**	**-21970**

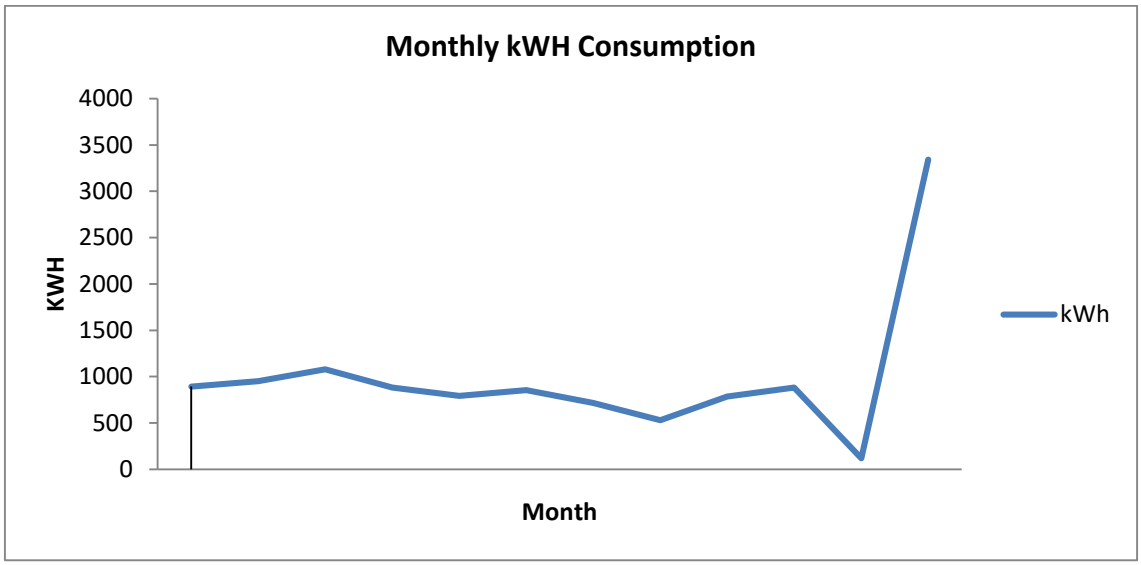

Figure 1 Monthly kWh Consumption

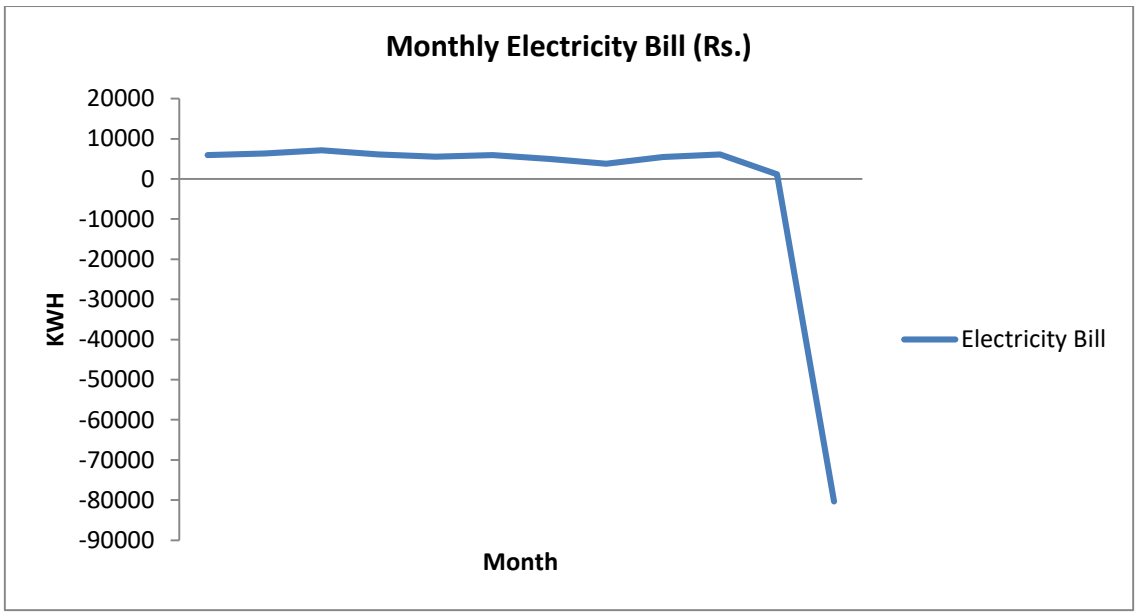

Figure 2 Monthly Electricity Bill vs kwh

2. Consumer Details of Meter No.366477958316

Consumer Details

Table 4 Consumer Details

Parameter	Details
Consumer No.	**366477958316**
Consumer Name	PRINCIPAL SSC GIRLS HOSTELAMRAVATI
Address	38/B SHIVAJI NAGAR MORSHI ROAD AMRAVATI
Pin Code	444603
Sanctioned Load (KW)	10 KW
Tariff	073/LT VII(B)
Bu/ Circle No	4295

Consumption Details

Table 5 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Electricity Duty (Rs)	Tax (Rs)	Total Current Bill (Rs)
Jul-21	463	373	639	2167	509	88	3776
Jun-21	257	373	355	1203	309	49	2288
May-21	766	373	1057	3585	802	146	5963
Apr-21	467	363	674	2261	528	89	3915
Mar-21	808	403	1172	5947	1580	154	9255
Feb-21	6,571	403	9528	48363	12242	1251	70713
Jan-21	100	3775	145	735	978	9	5641
Dec-20	0	0	0	0	0	0	0
Nov-20	0	0	0	0	0	0	0
Oct-20	0	0	0	0	0	0	0
Sep-20	0	0	0	0	0	0	0
Aug-20	0	0	0	0	0	0	0
Avg	**786**	**505**	**1131**	**5355**	**1412**	**149**	**8463**
Max	**6571**	**3775**	**9528**	**48363**	**12242**	**1251**	**70713**
Min	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Sum	**9432**	**6063**	**13569**	**64260**	**16946**	**1786**	**101551**

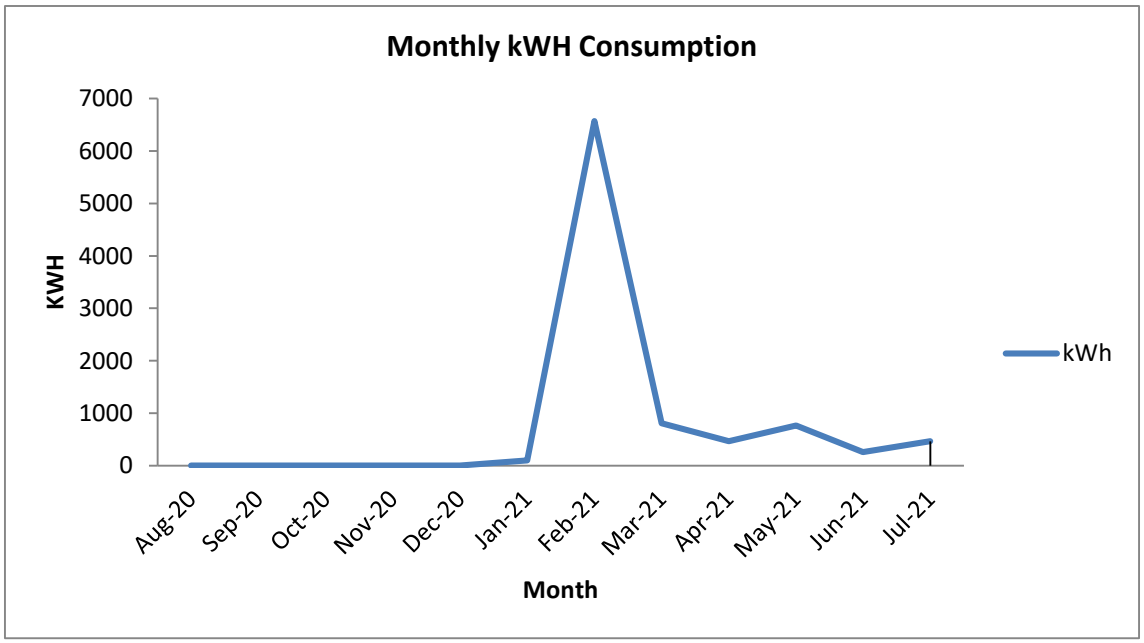

Figure 3 Monthly kWh Consumption

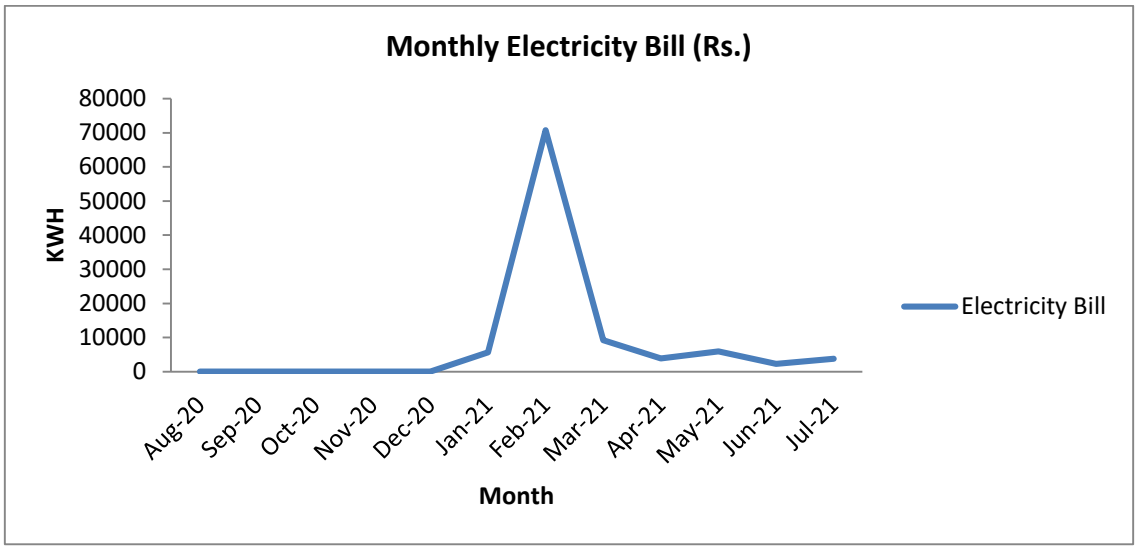

Figure 4 Monthly Electricity Bill vs kwh

3. Consumer Details of Meter No.366474922213

Consumer Details

Table 6 Consumer Details

Parameter	Details
Consumer No.	**366474922213**
Consumer Name	SHRI SHIVAJI ARTS AND COMMERCE COLLEGE
Address	38 B 7/2 SHRI SHIVAJI ARTS & COMMERCE COLLEGE
Pin Code	444603
Sanctioned Load (KW)	7.46 KW
Tariff	052/LT-II COMM
Bu/ Circle No	4295

Consumption Details

Table 7 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Electricity Duty (Rs)	Tax (Rs)	Total Current Bill (Rs)
Jul-21	566	415	781	4064	1105	108	6472
Jun-21	312	415	431	2240	648	59	3793
May-21	439	415	606	3152	876	84	5133
Apr-21	488	404	705	3584	985	93	5771
Mar-21	527	403	764	3879	1060	100	6206
Feb-21	642	403	931	4725	1272	122	7454
Jan-21	667	403	967	4909	1319	60	7658
Dec-20	741	443	1074	5454	1464	141	8577
Nov-20	0	0	0	0	0	0	0
Oct-20	0	0	0	0	0	0	0
Sep-20	0	0	0	0	0	0	0
Aug-20	0	0	0	0	0	0	0
Avg	**365**	**275**	**522**	**2667**	**727**	**64**	**4255**
Max	**741**	**443**	**1074**	**5454**	**1464**	**141**	**8577**
Min	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Sum	**4382**	**3302**	**6259**	**32007**	**8729**	**768**	**51063**

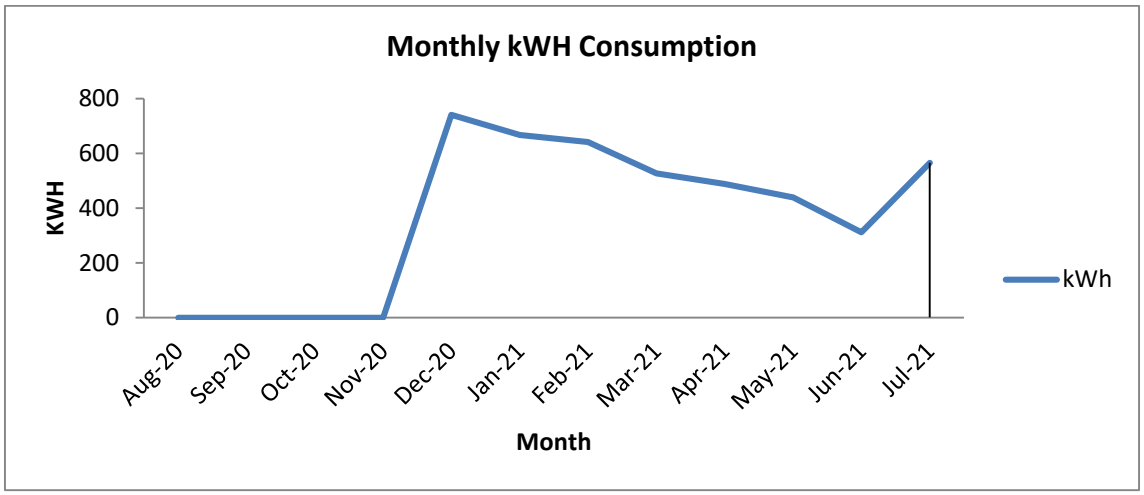

Figure 5 Monthly kWh Consumption

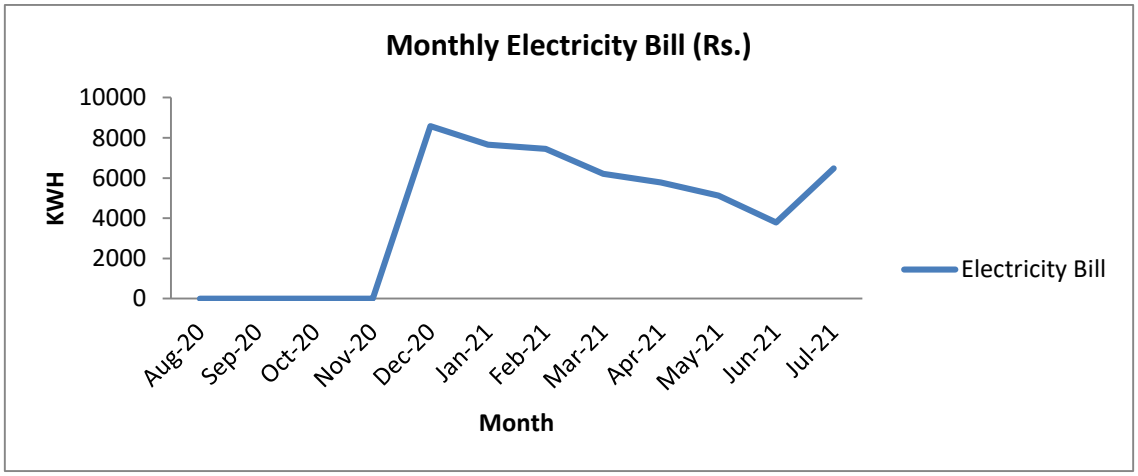

Figure 6 Monthly Electricity Bill vs kwh

4. Consumer Details of Meter No.366470080153

Consumer Details

Table 8 Consumer Details

Parameter	Details
Consumer No.	**366470080153**
Consumer Name	PRINCIPAL SVJ COLLAGE OF ARTS
Address	SHIVAJI NAGAR MORSHI ROAD AMRAVATI
Pin Code	444603
Sanctioned Load (KW)	7 KW
Tariff	073/LT VII(B)
Bu/ Circle No	4295

Consumption Details

Table 9 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)
Jul-21	342	373	472	1601	65	2511
Jun-21	465	373	642	2176	89	3279
May-21	697	373	962	3262	133	4730

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)
Apr-21	409	363	590	1981	78	3013
Mar-21	382	362	554	1857	73	2845
Feb-21	313	362	454	1521	60	2397
Jan-21	252	362	365	1225	23	1975
Dec-20	308	362	447	1497	59	2364
Nov-20	182	362	264	885	35	1545
Oct-20	138	362	200	671	26	1259
Sep-20	209	362	303	1016	40	-184
Aug-20	293	362	425	1424	56	2267
Avg	**333**	**365**	**473**	**1593**	**61**	**2333**
Max	**697**	**373**	**962**	**3262**	**133**	**4730**
Min	**138**	**362**	**200**	**671**	**23**	**-184**
Sum	**3990**	**4378**	**5678**	**19114**	**735**	**27999.6**

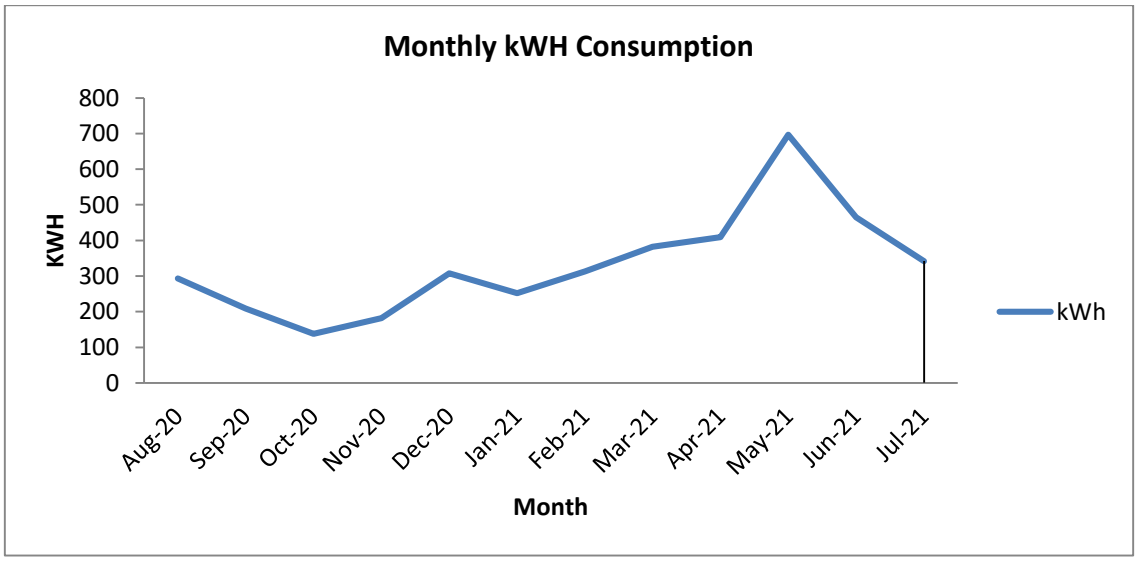

Figure 7 Monthly kWh Consumption

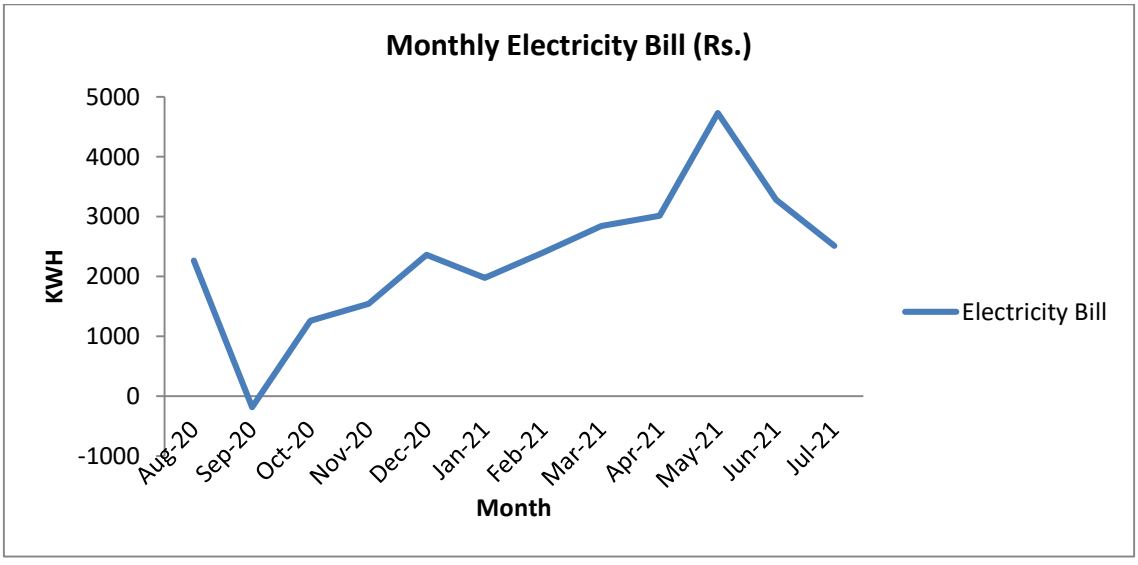

Figure 8 Monthly Electricity Bill vs kwh

5. Consumer Details of Meter No.366471915232

Consumer Details

Table 10 Consumer Details

Parameter	Details
Consumer No.	**366471915232**
Consumer Name	THE PRINCIPAL
Address	SHIVAJI ARTS & COMMERCE COLLEGE MORSHI ROAD
Pin Code	444601
Connected load (KW)	2
60% of con. Demand (KVA)	1.2
Sanctioned Load (KW)	8 Kw
Tariff	073/LT VII(B)
Bu/ Circle No	4295

Consumption Details

Table 11 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)
Jul-21	0	0	0	0	0	0
Jun-21	0	0	0	0	0	0
May-21	0	0	0	0	0	0
Apr-21	0	0	0	0	0	0
Mar-21	0	0	0	0	0	0
Feb-21	0	134	0	0	0	134
Jan-21	0	362	0	0	0	362
Dec-20	0	362	0	0	0	362
Nov-20	581	362	842	2824	111	4139
Oct-20	738	362	1070	3587	141	5159
Sep-20	1034	362	1499	5025	197	4412
Aug-20	411	362	596	1997	78	3034
Avg	**230**	**192**	**334**	**1119**	**44**	**1467**
Max	**1034**	**362**	**1499**	**5025**	**197**	**5159**
Min	**0**	**0**	**0**	**0**	**0**	**0**
Sum	**2764**	**2306**	**4008**	**13433**	**526**	**17601**

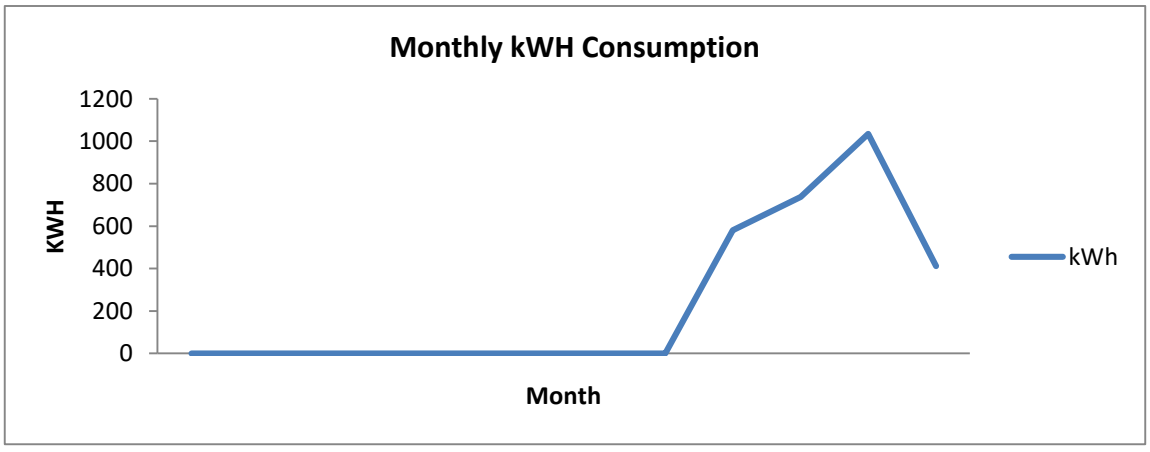

Figure 9 Monthly kWh Consumption

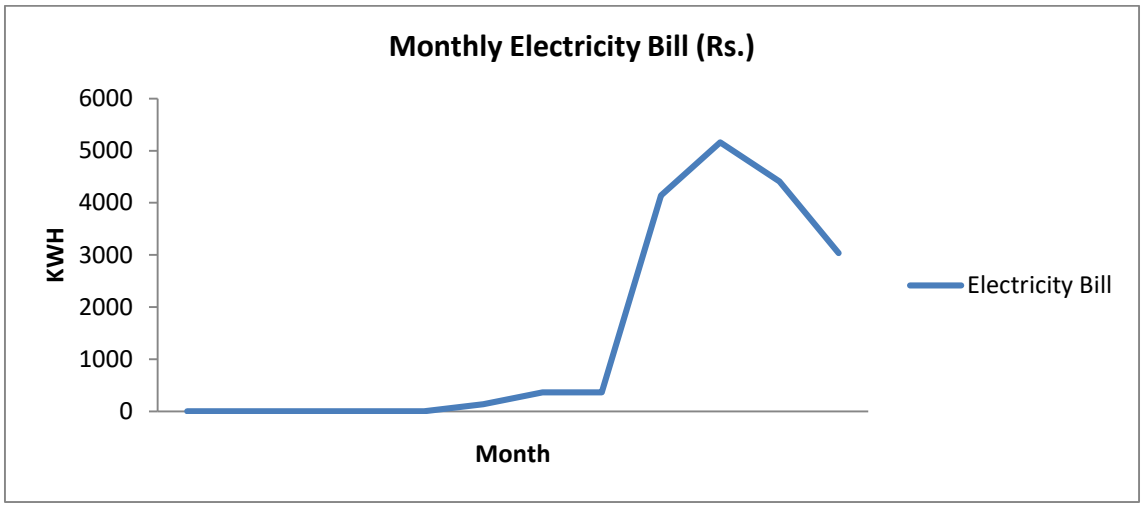

Figure 10 Monthly Electricity Bill vs kwh

6. Consumer Details of Meter No.366471918118

Consumer Details

Table 12 Consumer Details

Parameter	Details
Consumer No.	**366471918118**
Consumer Name	THE PRINCIPAL
Address	SHIVAJI ART & COMM.COLLEGE AMRAVATI 444601
Pin Code	444601
Connected load (KW)	8
60% of con. Demand (KVA)	4.8
Sanctioned Load (KW)	8 Kw
Tariff	073/LT VII(B)
Bu/ Circle No	4295

Consumption Details

Table 13 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)
Jul-21	196	373	270	917	37	1598
Jun-21	82	373	113	384	16	886
May-21	146	373	201	683	28	1286
Apr-21	164	363	237	794	31	1425
Mar-21	189	362	274	919	36	1591
Feb-21	252	362	365	1225	48	2000
Jan-21	259	362	376	1259	23	2020
Dec-20	190	362	276	923	36	1597
Nov-20	207	362	300	1006	39	1708
Oct-20	242	362	351	1176	46	1935
Sep-20	408	362	592	1983	78	2137
Aug-20	135	362	196	656	26	1240
Avg	**206**	**365**	**296**	**994**	**37**	**1618**
Max	**408**	**373**	**592**	**1983**	**78**	**2137**
Min	**82**	**362**	**113**	**384**	**16**	**886**
Sum	**2470**	**4378**	**3551**	**11925**	**444**	**19421**

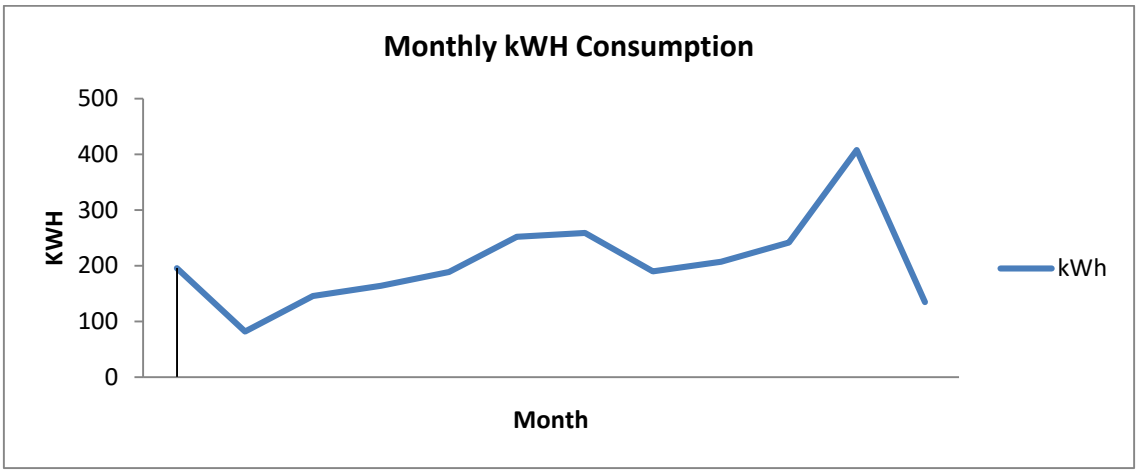

Figure 11 Monthly kWh Consumption

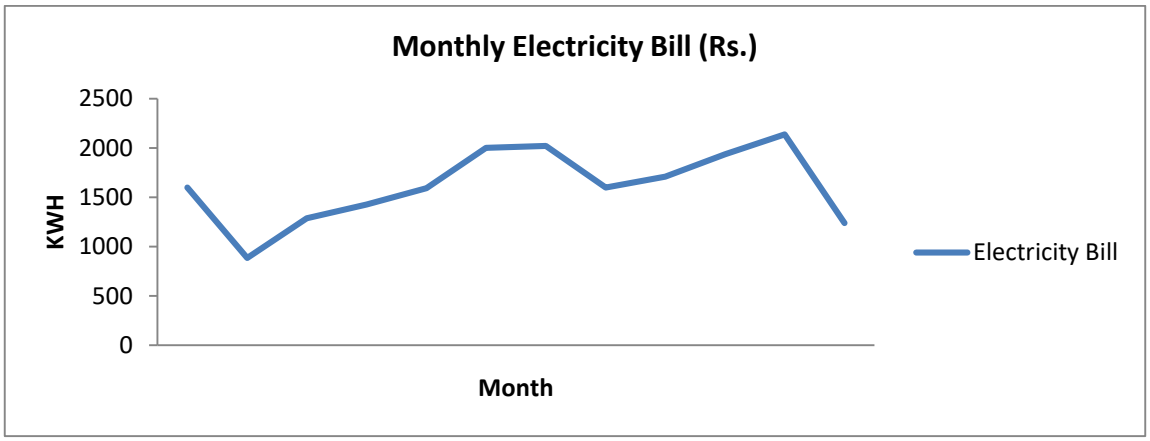

Figure 12 Monthly Electricity Bill vs kwh

7. Consumer Details of Meter No.366470077608

Consumer Details

Table 14 Consumer Details

Parameter	Details
Consumer No.	**366470077608**
Consumer Name	THE PRINCIPAL SHIVAJI COLLAGE OFART
Address	MORSHI ROAD SHIVAJI NAGAR AMRAVATI
Pin Code	444601
Sanctioned Load (KW)	3 KW
Tariff	073/LT VII(B)
Bu/ Circle No	4295

Consumption Details

Table 15 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)
Jul-21	202	373	279	945	38	1636
Jun-21	90	373	124	421	17	936
May-21	264	373	364	1236	50	2023
Apr-21	133	363	192	644	25	1225

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)
Mar-21	179	362	260	870	34	1526
Feb-21	182	362	264	885	35	1545
Jan-21	186	362	270	904	17	1552
Dec-20	78	362	113	379	15	869
Nov-20	254	362	368	1234	48	2013
Oct-20	317	362	460	1541	60	2423
Sep-20	433	362	628	2104	82	2234
Aug-20	145	362	210	705	28	1305
Avg	**205**	**365**	**294**	**989**	**38**	**1607**
Max	**433**	**373**	**628**	**2104**	**82**	**2423**
Min	**78**	**362**	**113**	**379**	**15**	**869**
Sum	**2463**	**4378**	**3532**	**11868**	**450**	**19285**

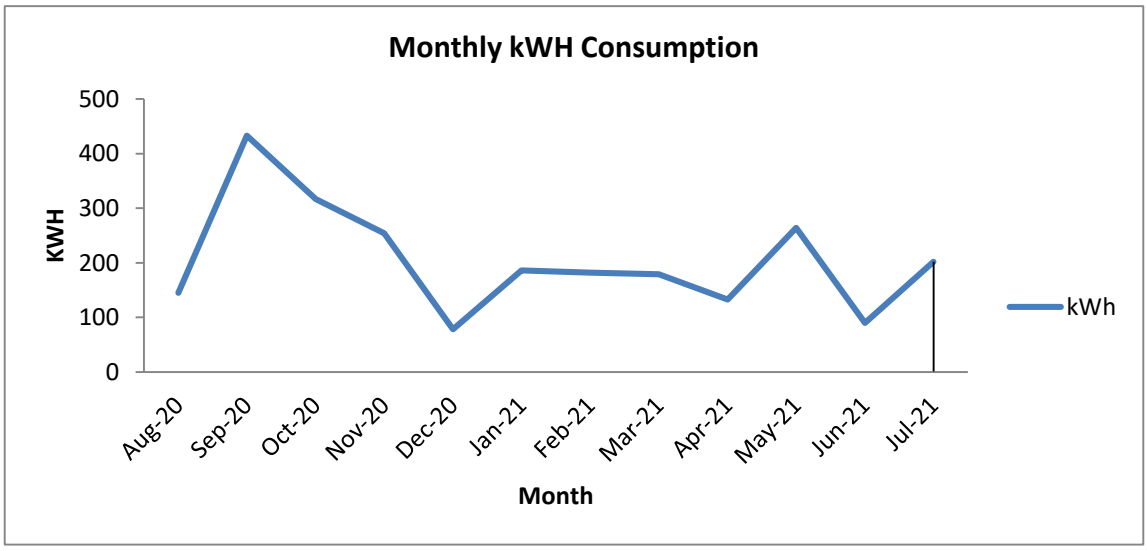

Figure 13 Monthly kWh Consumption

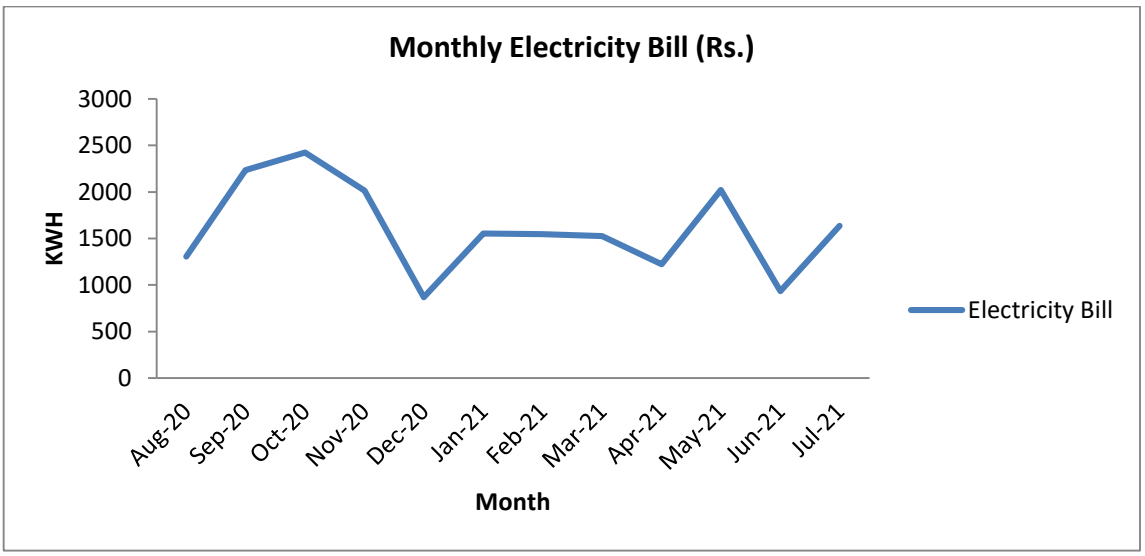

Figure 14 Monthly Electricity Bill vs kwh

8. Consumer Details of Meter No.366470078493

Consumer Details

Table 16 Consumer Details

Parameter	Details
Consumer No.	**366470078493**
Consumer Name	THE PRINCIPAL SHIVAJI COLLEGE
Address	MORCHI ROAD, AMRAVATI
Pin Code	444603
Sanctioned Load (KW)	8 KW
Tariff	073/LT VII(B)
Bu/ Circle No	4295

Consumption Details

Table 17 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Tax (Rs)	Total Current Bill (Rs)
Jul-21	38	373	52	178	7	611
Jun-21	31	373	43	145	6	567
May-21	90	373	124	421	17	936
Apr-21	0	363	0	0	0	363
Mar-21	155	362	225	753	30	1370
Feb-21	48	362	70	233	9	674
Jan-21	48	362	70	233	4	669
Dec-20	96	362	139	467	18	986
Nov-20	207	362	300	1006	39	1708
Oct-20	46	362	67	224	9	661
Sep-20	32	362	46	156	6	186
Aug-20	59	362	86	287	11	746
Avg	**71**	**365**	**102**	**342**	**13**	**790**
Max	**207**	**373**	**300**	**1006**	**39**	**1708**
Min	**0**	**362**	**0**	**0**	**0**	**186**
Sum	**850**	**4378**	**1221**	**4102**	**157**	**9475**

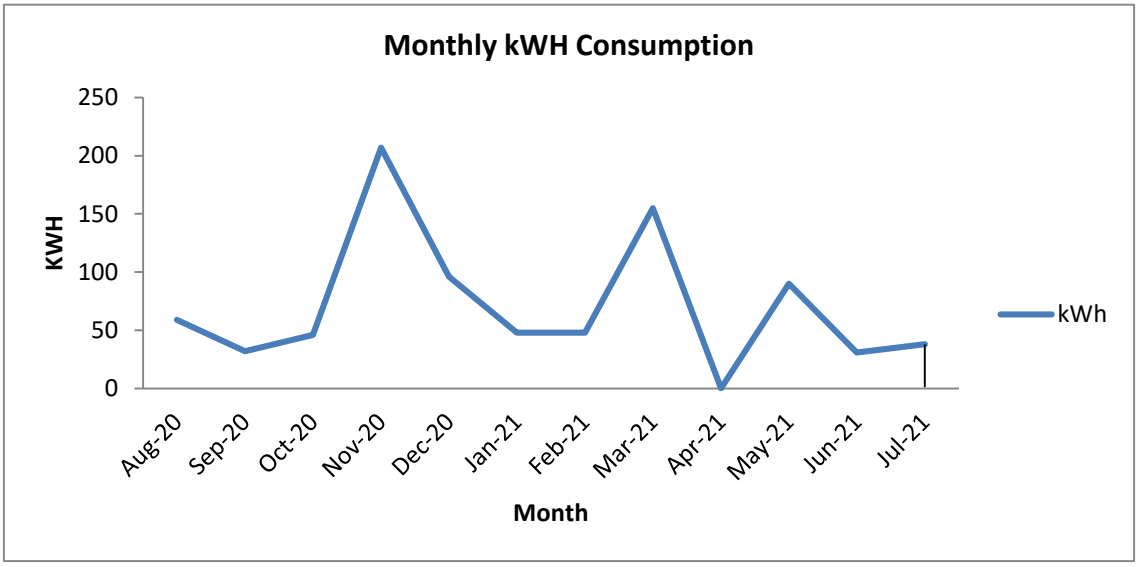

Figure 15 Monthly kWh Consumption

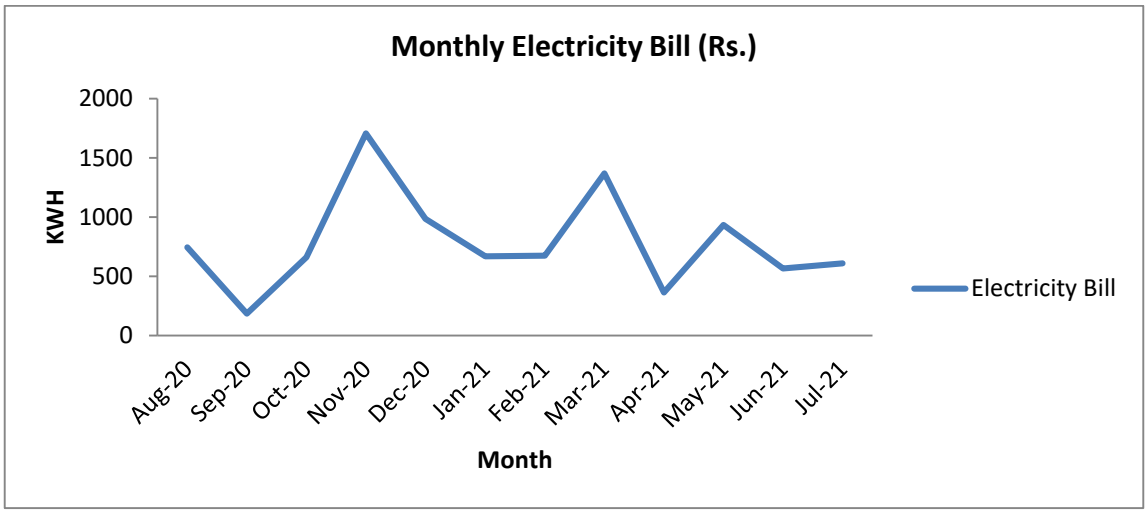

Figure 16 Monthly Electricity Bill vs kwh

9. Consumer Details of Meter No.366470080170

Consumer Details

Table 18 Consumer Details

Parameter	Details
Consumer No.	**366470080170**
Consumer Name	PRINCIPAL SHIVAJI COLL HOME SCIENCE
Address	MORSHI ROAD AMRAVATI 444603
Pin Code	444603
Connected load (KW)	8
60% of con. Demand (KVA)	4.5
Sanctioned Load (KW)	7.5Kw
Tariff	073/LT VII(B)
Bu/ Circle No	4295

Consumption Details

Table 19 Billing Data

Month	kWH	Demand Charges (Rs)	Wheeling Charges (Rs)	Energy Charges (Rs)	Total Current Bill (Rs)
Jul-21	16	373	22	75	572
Jun-21	1	373	1	4	459
May-21	2	373	2	9	466
Apr-21	1	363	1	4	447
Mar-21	1	362	1	44	446
Feb-21	9	362	13	44	508
Jan-21	2	362	3	10	453
Dec-20	1	362	1	5	446
Nov-20	70	362	102	340	986
Oct-20	100	362	145	486	1221
Sep-20	175	362	254	851	1690
Aug-20	15	362	22	73	555
Avg	**33**	**365**	**47**	**162**	**687**
Max	**175**	**373**	**254**	**851**	**1690**
Min	**1**	**362**	**1**	**4**	**446**
Sum	**393**	**4378**	**567**	**1944**	**8250**

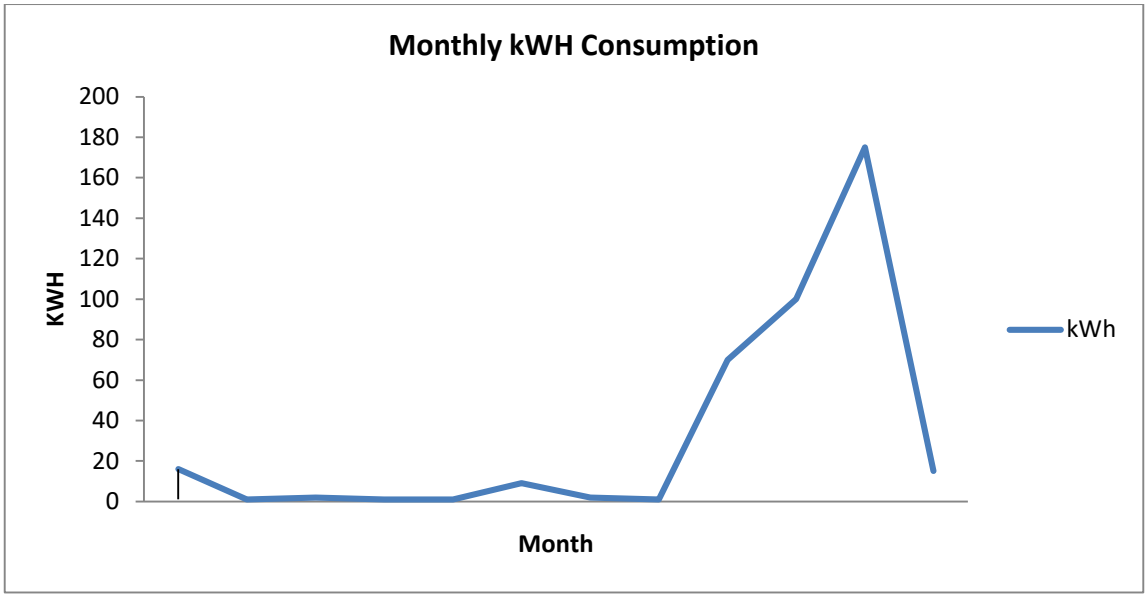

Figure 17 Monthly kWh Consumption

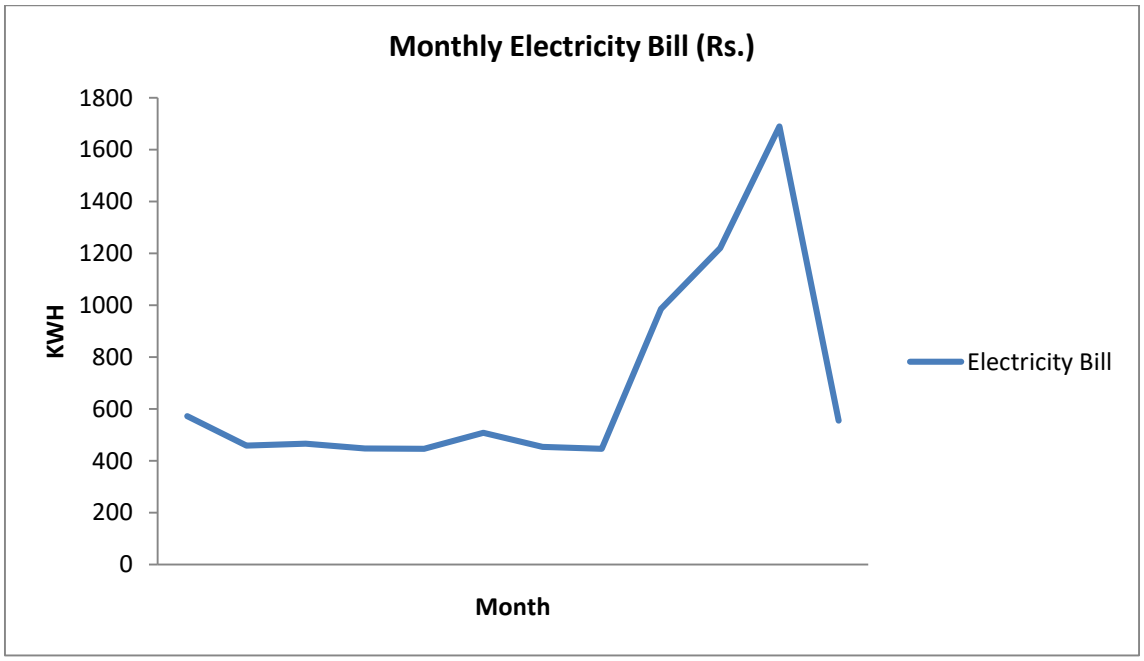

Figure 18 Monthly Electricity Bill vs kwh

4.2. Connected Load Quantity of Buildings

Connected Load of Building

Table 20 Connected Load of All Building/Departments

Fixtures	Wattage	History Dept	Marathi Dept	Mass. Comm. Building	Office	Staff Room	NAC Dept	TOTAL QTY	TOTAL KW
Ceiling Fan	75	1	3	5	21	29	1	60	4.5
Tube Light	28				2			2	0.06
Tube Light	36				7			7	0.25
Tube Light	40	1	3	5	4	2	1	16	0.64
LED Tube Light	18				6		3	9	0.16
LED Light	30				4	6		10	0.3
CFL DL	18				2			2	0.04
Air Cooler	300				2			2	0.6
Water Cooler	700				2			2	1.4
Fridge	700				1			1	0.7
Computer	150	1	3	4	13		1	22	3.3
Printer	150				10			10	1.5
Xerox M/c	500				1			1	0.5
Water Motors	2235				2			2	4.47
A/C (1.5 Ton) 2*	1745				1			1	1.75
Split A/C (2 Ton) 3*	2266				2			2	4.53
Split A/C (2 Ton) 5*	1732				1			1	1.73
TOTAL									**26.4**

Fixtures	Wattage	Audit orium	Sociology Dept + Hall	Hall	Home Sci. Dept	Mukt Vid.	Boys Hostel	TOTAL QTY	TOTAL KW
Ceiling Fan	75		21	12	15	14	10	72	5.4
Exhaust Fan	40		1					1	0.04
Exhaust Fan	55				2			2	0.11
Tube Light	36				5			5	0.18
Tube Light	40	6	10	15	15	8	10	64	2.56
LED Tube Light	18					3		3	0.054
LED Light	30		10					10	0.3
LED Bulb	9		1				20	21	0.189
CFL DL	18					1		1	0.018
Bulb	60					2		2	0.12
Air Cooler	150		1					1	0.15
Air Cooler	300		1					1	0.3
Water Cooler	700					1		1	0.7
Computer	150	1	4			3		8	1.2
Printer	150		1			2		3	0.45
Xerox M/c	500					1		1	0.5
Projector	150		1					1	0.15

Fixtures	Wattage	Audit orium	Sociology Dept + Hall	Hall	Home Sci. Dept	Mukt Vid.	Boys Hostel	TOTAL QTY	TOTAL KW
Split A/C (2 Ton) 3*	2266	3						3	6.798
TOTAL									**19.219**

Fixtures	Wattage	Mass Commu.	Gymnasium	Girls Hostel	Street Light	Library	TOTAL QTY	TOTAL KW
Ceiling Fan	100					*2*	2	0.2
Ceiling Fan	75	5	2	42		18	67	5.025
Tube Light	36					6	6	0.216
Tube Light	40	2	2	49		15	68	2.72
LED Tube Light	18			25			25	0.45
LED Light	12	10					10	0.12
LED Street Light	54			1	15		16	0.864
Air Cooler	300	1					1	0.3
Water Cooler	700			1			1	0.7
TV Lcd	60	2					2	0.12
Computer	150	8				30	38	5.7
Printer	150	1				5	6	0.9
Split A/C (1.5 Ton) 2*	1745	1				2	3	5.235
TOTAL								**22.55**

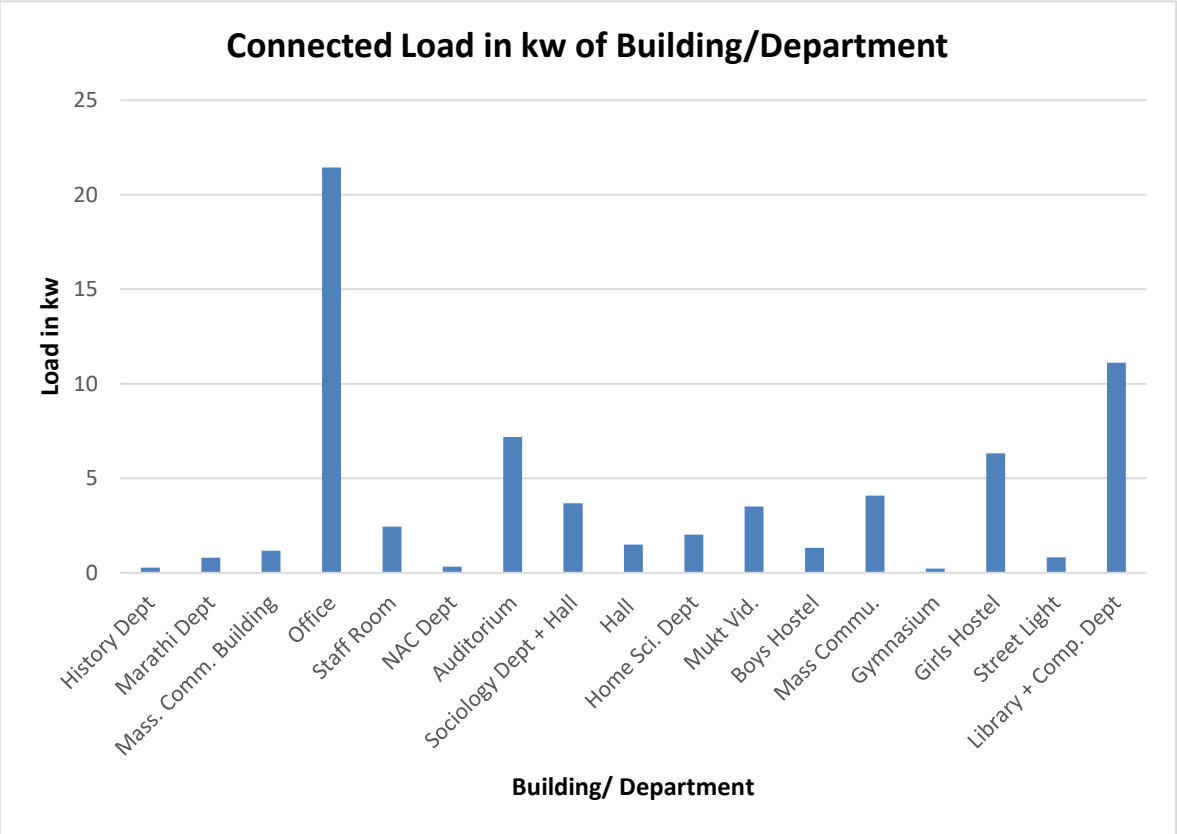

Figure 19 Connected Load in kw of Building/Department

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 More Efficient Lights	0.84	6446.88	5.48	0.36	2.34

Observations:

Facility has installed 28W,36W & 40W Tube lights in the buildings

Recommendations:

During energy audit, it is observed that facility has installed 28W,36W & 40W Tube lights at some of the places in the facility The operating hours for these lightings are around 6 hours. 28W,36W & 40W Tube lights can be replaced with the LED lightings thereby achieving significant energy consumption reduction. The 28 W, 36W Tube lights 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 lightings have better efficiency as well as better lifetime than 28W,36W & 40W Tube lights.

Energy Saving Calculations:

Particular	Unit	Value
Energy Saving Calculation		
Power consumption of TL,MV lamps	KW	5.92
Power consumption of suitable LED	KW	2.66
Average power saving after replacement with LED	KW	3.26
Replacement of conventional lights with suitable LEDs	Nos	148.00
Average working hour per day	hrs	6
No. of working days in a year	Days	330
Cost Benefit Calculation		
Annual Energy Saving potential	kWh	6447
Electricity tariff	Rs/unit	5.6
Annual Cost Saving	Rs. Lakh	0.36
Total investment cost	Rs. Lakh	0.84
Annual Saving	Rs. Lakh	0.36
Simple Payback Period	Years	2.34

Type of Existing Fitting	Wattage	Qty	Proposed LED W	Price - Rs/Unit	Existing KW	Proposed KW	Saved kW	Investment Rs Lakh
Tube light	40	148	18	570	5.92	2.66	3.26	0.84
TOTAL	**40**	**148**	**18**	**570**	**5.92**	**2.66**	**3.26**	**0.84**

Sr. No	Item	C.S.R No.	Rate	Unit
1	18W LED Tube Light	2-1-22.	570	Each

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

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)		
2	Replacement of Existing Fans with Energy Efficient Fans	1.94	5544.00	4.71	0.31	6.24

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

Energy Saving Calculations:

Particular	Unit	Value
Existing energy consumption of Fan	kWh/year	14850
Fan Wattage	Watt	35
Energy consumption after replacing with Energy Efficient Super Fan	kWh/year	6930
Operating hrs/year	Hrs/day	6
No. of working days in a year	Days	300
Diversity factor	%	70
Annual Saving	kWh/year	5544
Unit rate	Rs/kWh	5.6
Annual Saving	Rs. In Lacs	0.31

Category	Nos	Estimated Running kW
Ceiling Fan 75 W	100	7.50
Total	**100**	**7.50**

Sr. No	Item	C.S.R No.	Rate	Unit
1	Super-efficient ceiling fan	2-12-21.	1937	Each

ECM 3: Optimize The AC Temperature Setting to 23-25 Degree Celsius

ECM No.	Energy efficiency improvement measures	Investment Rs. In Lakh	Estimated saving Electricity kWh	Carbon credit (Tons of CO2)	Estimated Savings Rs. In Lacs	Estimated Payback Years
3	Optimize The AC Temperature Setting To 23-25 Degree Celsius	0.00	317.52	0.28	0.0178	0.00

Observations:

During Energy Audit, it is observed that ACs installed in facility run with lower temperature than the recommended temperatures.

Recommendations:

We recommend to keep the set temperature of AC between 23 to 25^0C to get the energy saving.

Standard:

It is known that a 1°C raise in AC temperature can help to save almost 3 % on power consumption (this can also be verified in BEE guideline: Chapter 4. HVAC and Refrigeration System).

The TR capacity of the same AC systems will also increase with the increase in evaporator temperature (AC set points), as given in Table below:

Effect of variation in Evaporator Temperature on Compressor Power Consumption			
Evaporator temperature(^{0}C)	Refrigeration Capacity* (tons)	Specific Power Consumption	Increase in kW/ton (%)
5	67.58	0.81	-
0	56.07	0.94	16
-5	45.98	1.08	33
-10	37.2	1.25	54
-20	23.12	1.67	106

* Condenser temperature 40°C

Present Energy Consumption Details:

Sr No	Type	Ton	Qty	Annual Consumption (kWh/annum)
1	Split AC	1.5	4	3528
2	Split AC	2	5	5880
3	Split AC	2	1	1176
TOTAL				**10584**

Energy Saving Calculations:

Particular	Unit	Value
Estimated consumption of ACs	kWh/year	10584
Estimated Saving	%	3%
Operating Hrs per day	hrs./day	4
Operating days per year	Days/year	150
Estimated Saving	kWh/year	318
Unit Rate	Rs/kWh	5.6
Annual Saving	Rs Lakh/year	0.0178

6. ANNEXURE (SOLAR)

1) Introduction

The solar energy has a great potential as future source of energy. With its availability in large quantity almost in every corner of the country, solar power has the distinctive advantage of generating power at local and decentralized levels and being one of the prime factors for empowering people at grassroots level. The solar mission, which is part of the National Action Plan on Climate change has been set up to promote the development and use of solar energy for power generation and other uses with the ultimate objective of making solar energy competitive with fossil-based energy options. The solar photovoltaic device systems for power generation had been deployed in the various parts in the country for electrification where the grid connectivity is either not feasible or not cost effective as also some times in conjunction with diesel based generating stations in isolated places, communication transmitters at remote locations. With the downward trend in the cost of solar energy and appreciation for the need for development of solar power, solar power projects have recently been implemented. A significant part of the large potential of solar energy in the country could be developed by promoting solar photovoltaic power systems of varying sizes as per the need and affordability coupled with ensuring adequate return on investment.

2) Benefits of Solar Energy

a. Power from the sun is clean, silent, limitless and free.

b. Photovoltaic process releases no CO2, SO2, or NO2 gases which are normally associated with burning finite fossil fuel reserves and don't contribute to global warming.

c. Photovoltaic are now a proven technology which is inherently safe as opposed to other fossil fuel based electricity generating technologies.

d. Solar power shall augment the needs of peak power needs.

e. provides a potential revenue source in a diverse energy portfolio

f. Assists in meeting renewable portfolio standards goals.

This proposal is prepared for design, engineering, procurement / manufacture and installation of solar power generating system. The grid-tie solar photovoltaic power generation system is mainly composed of PV array, String Inverter, and PV mounting structure.

It also consists of supporting devices like AC / DC switchgears, Lighting Arrestor, Earth Electrodes, AC / DC cables. As there is no any battery, it’s maintenance cost is negligible and initial investment per KW is very low.

3) Objective

- Provide reliable, clean, regulated, un-interrupted power on demand to the pre-identified critical loads
- System to provide low life cycle cost and maximize savings to the beneficiaries.

- To save diesel in institutions and other commercial establishments including industry facing huge power cuts especially during daytime.

4) Design Assumptions

General

a. The Solar Radiation Data's are based on standard books & simulation software as NASA and Metronome. The Mean Hourly Radiation Data is considered.

b. The module rating considered is tentative. The exact module sizing and rating will depend on the availability of cell grade and site suitability.

c. Solar Panels are roof/ground mounted in one location. Environmentally protected, closed, ventilated, inverter room at minimum distance from PV modules.

d. Application: Self consumption, captive grid or NET metering.

e. Emergency Backup: Generator or any other source in absence of Grid.

5) System Description

Solar Power Plant comprises of the main equipment and components listed below:

1. Solar PV Modules
2. String Inverter with MPPT
3. Module mounting system
4. Monitoring system
5. Cables & connectors

Each of the sub systems has been described for the functionality and operation modes. The physical construction of the system follows a modular approach, which is field-tested and is regularly used for delivery of power systems.

5.1 Solar PV Module (Electrical Features)

The PV modules convert the light reaching them into DC power. The amount of power they produce is roughly proportional to the intensity and the angle of the light reaching them. They are therefore required to be positioned to take maximum advantage of available sunlight within sitting constraints.

5.2 Solar PV Module (Mechanical Features)

Solar Module design will conform to following Mechanical requirements:

- Toughened,
- low iron content,
- High transmissivity from glass.
- Anodized Aluminum Frame.
- Ethyl Vinyl Acetate (EVA) encapsulating.

- Tedlar/Polyester trilaminate back surface.
- ABS plastic terminal box for the module output termination with gasket to prevent water & moisture.
- Resistant to water, abrasion hail impact, humidity & other environment of actors for the worst situation at site.

5.3 Module Mounting Structure

The structure shall be designed to allow easy replacement of any module and shall be in line with site requirement. Structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly. There shall be no requirement of welding or complex machinery at site. The array structure shall have tilt arrangement to adjust the plane of the solar array for optimum tilt.

5.4 Junction Box

The junction boxes shall be dust, vermin and waterproof and made of FRP/ABS Plastic with IP65 protection. The terminals shall be connected to copper bus bar arrangement of proper sizes. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable marking shall be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification

5.5 String Inverter

The STRING INVERTER is A combination of Solar Charger (MPPT), Inverter and synchronization unit for two different AC supplies, all housed in a single unit. Maximum power point tracker (MPPT) shall be integrated into it to maximize energy drawn from the solar array. The Inverter converts the DC available from the array into an AC output. The output of the inverter is filtered to reduce the harmonics to an acceptable level (less than 5%). MPPT shall be microprocessor/micro controller based to minimize power losses and maximize energy utilization. The efficiency of MPPT shall not be less than 90% and shall be designed to meet the solar PV Array capacity.

5.6 AC /DC Cables

We use DC & AC cables of Lap, Apar, Polycab, Havels, Finolex or equivalent make to ensure minimum losses in transmission.

In order to complete the energy study that leads to the construction of a photovoltaic installation, hourly series of global horizontal irradiation values for a complete year are used, which resume the irradiation and other meteorological parameters behavior over a long term. We use PV. SYST. Software to workout optimum power production at site with minimum loses.

5.7 Grounding and Lighting Protection

- A protective earth (PE) connection ensures that all exposed conductive surfaces are at the same electrical potential as the surface of the Earth, to avoid the risk of electrical shock. It ensures that in the case of an insulation fault (a "short circuit"), a very high current flows, which will trigger an over current protection device as fuses and circuit breakers that disconnects the power supply.
- A functional earth connection serves a purpose other than providing protection against electrical shock. In contrast to a protective earth connection, a functional earth connection may carry a current during the normal operation of a device.
- Lightning protection is a very specialized form of grounding used in an attempt to divert the huge currents from lightning strikes. A ground conductor on a lightning arrester system is used to dissipate the strike into the earth.
- Lightning ground conductors must carry heavy currents for a short period of time. To limit inductance and the resulting voltage due to the fast pulse nature of lightning currents, lightning ground conductors may be wide flat strips of metal, usually run as directly as possible to electrodes in contact with the earth.
- In proposal, the entire system is fully provided with the required lighting and grounding protection.

6) Solar PV Location

Details of Building:

Average Unit Consumption / year of Buildings is **38567 Units** (Ref. 12 months Electricity Bills)

Area		Length (ft)	Width (ft)	Area (Sq ft)	SOLAR PV CAPACITY (kW)
Office Building	Area 1	100	25	2500	31.25
Arts & Commerce Faculty Building	Area 1	60	30	1800	22.50
	Area 2	60	30	1800	22.50
Home Science Department	Area 1	50	25	1250	15.63
	Area 2	40	25	1000	12.50
Girls Hostel	Area 1	60	15	900	11.25
	Area 2	60	15	900	11.25
	Area 3	30	15	450	5.63
	Area 4	30	15	450	5.63
Library	Area 1	60	40	2400	30.00
TOTAL				**13450**	**168.13**

Total Available Area = 13450 Sq. Ft. & As per available shadow free Area maximum 168 KW Plant can be installed on buildings as per details mentioned in above table.

7) Capacity Evaluation

Calculation for Required Solar Capacity plant to fulfill In-house Requirement

Calculation to Fulfill Building Total Load Requirement			
Sr. No.	**Details**	**Value**	**Unit**
1	Average electrical consumption per year	38567	KWh
2	Units generated per day per KWp	4.50	KWh/KWp/day
3	Units generated per Year per KWp (330 days / Year)	1485	KWh/KWp/Year
4	Solar KW capacity For 38567 KWh consumption / year	26	KWp

As per electrical consumption (Building Load), capacity of Solar Power Plant required is 26 KWp. As per shadow free space available on building maximum 136 KWp plant can be installed which is more than the actual requirement of full Electrical Load.

It is suggested to install Solar Plant of Capacity 26 KWp, which can be installed on building itself & it covers all required load.

The SPV power plant with proposed capacity of 26 KWp would be connected to the main electrical distribution panel. The system would meet full load requirement of the connected load during the day. Advance control mechanism in the Power Conditioning Unit will ensure that the maximum power generated by PV modules will be utilized first and the balance requirement of power will be met by either grid or DG set

The 26 KWp SPV Power Plant is estimated to afford annual energy feed of 38567 KWh/year (After considering all losses) considering efficiency of the solar module as 15.16%, Power Conditioning Unit (PCU) efficiency as 98.3% and losses in the DC and AC system as 3%.

8) Budgetary Estimation of the Project

Details	Value	Unit
Shadow free space required for approx. 1 KWp Solar Plant	80	Sq.Ft
Shadow free space available at Facility	13450	Sq.Ft.
Solar Plant capacity to be Installed at Facility	168.13	KWp
Solar Plant Requirement as per actual consumption	26	KWp
Installation Cost Per KW for 1 KWp Solar Plant	0.57	Rs. In Lakh
Gross Estimated System cost (For 26 KWp Grid Connected Solar Plant)	15	Rs. In Lakh
Unit generated per day per kWp	4.5	KWh
Electricity generation per day for 26 KWp Grid Connected Solar Plant	117	KWh/day
Electricity generation per year for 26 KWp Grid Connected Solar Plant (330 days/year)	38567	KWh/year
Average Electricity Unit Cost	5.6	Rs./KWh
Electricity cost saved per year	2.16	Rs. In Lakh
Simple payback period	6.85	**Years**

7. LIST OF INSTRUMENTS

POWER ANALYSER

Picture 1 ALM 20 Power Analyser

ALM 20 Power Analyser 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	0.0º ….360.0º
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

INFRARED THERMOMETER

Picture 4 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 5 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 ~ 90% RH
Storage temperature and humidity	-20°C ~ 50°C, 10% RH ~ 90% RH
Power	9V battery
Unit Size	52.5 x 52.5 x 166 mm
Auto power off	After 5 minutes

PPS ENERGY SOLUTIONS PVT. LTD.

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