Detailed Project Report

Energy Efficiency Improvement
In
Sant Gadge Baba Amravati University

Address:

Mardi, Near Tapovan Gate, Amravati, Maharashtra-444602

SGBAU

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Prepared By

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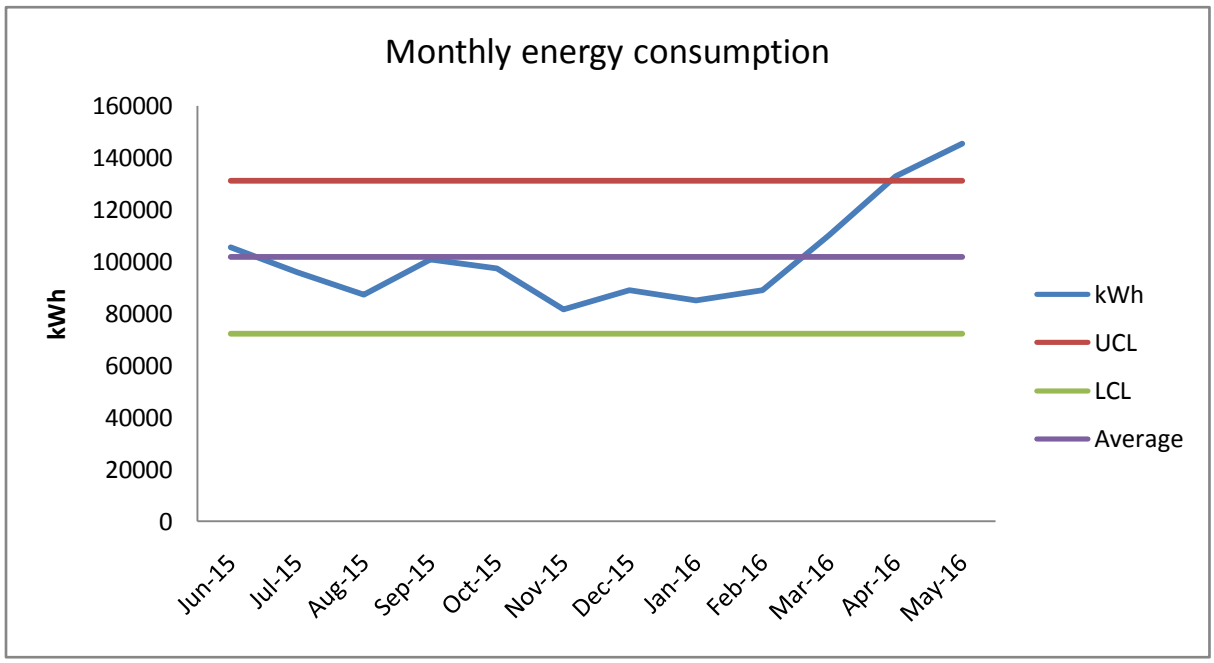
1. Executive Summary

A detailed Energy Audit was carried out at Sant Gadge Baba Amravati University, by PPS Energy Solutions Pvt. Ltd. (MEDA – Maharashtra Energy Development Agency empanelled Energy Auditing Firm). This audit was conducted under the energy efficiency program of MEDA in Government Buildings.

The University is having an HT connection. The total average energy consumption is **101806** kWh per month. The total average monthly electricity bill is Rs 910950.



The recommendation for energy efficiency and cost reduction are as follows:

Sr. No.	Equipment Name	ECM Details	Investment (Rs. in Lakh)	Savings (kWh /year)	Carbon credit (Tons of CO_2)	Saving (Rs. in Lakh / Year)	Payback (Years)
1	Substation	Power factor improvement	7.8	0	0.00	5.48	1.4
2	Contract demand	Changing Contract demand	8.9	0	0.00	1.60	5.6

Sr. No.	Equipment Name	ECM Details	Investment (Rs. in Lakh)	Savings (kWh /year)	Carbon credit (Tons of CO_2)	Saving (Rs. in Lakh / Year)	Payback (Years)
3	Tube Lights	Replacement of 40 Watt Tube lights with LED tube lights	28.0	77760	69.56	6.22	4.5
4	Electric Motors and Pumps	Maintenance of Monoblock pumps and electric motors - cleaning fan inlet, cooling fins, replacement of bearings and proper greasing	0.5	7648	6.84	0.61	0.8
5	Electric Motors and Pumps	Peak Load management- Running the water pumps during off peak hours	0.0	0	0.00	0.72	0.0
6	ACs	Optimize the temperature setting to 25°C	0.0	6521	5.83	0.52	0.0
7	ACs	Replacement of No star ACs (1.5 T and 2.0 T) with 5 stars ACs.	44.1	167006	149.39	13.36	3.3
8	Street Light	Replacement of existing street light with LEDs	10.3	54192	48.48	4.34	2.4
9	Fans	Replacement of existing old (without star rating) fans with 5 star rated energy efficient fans	50.0	105840	94.68	8.47	5.9
Total			**150**	**418967**	**375**	**41**	**3.6**

2. Introduction

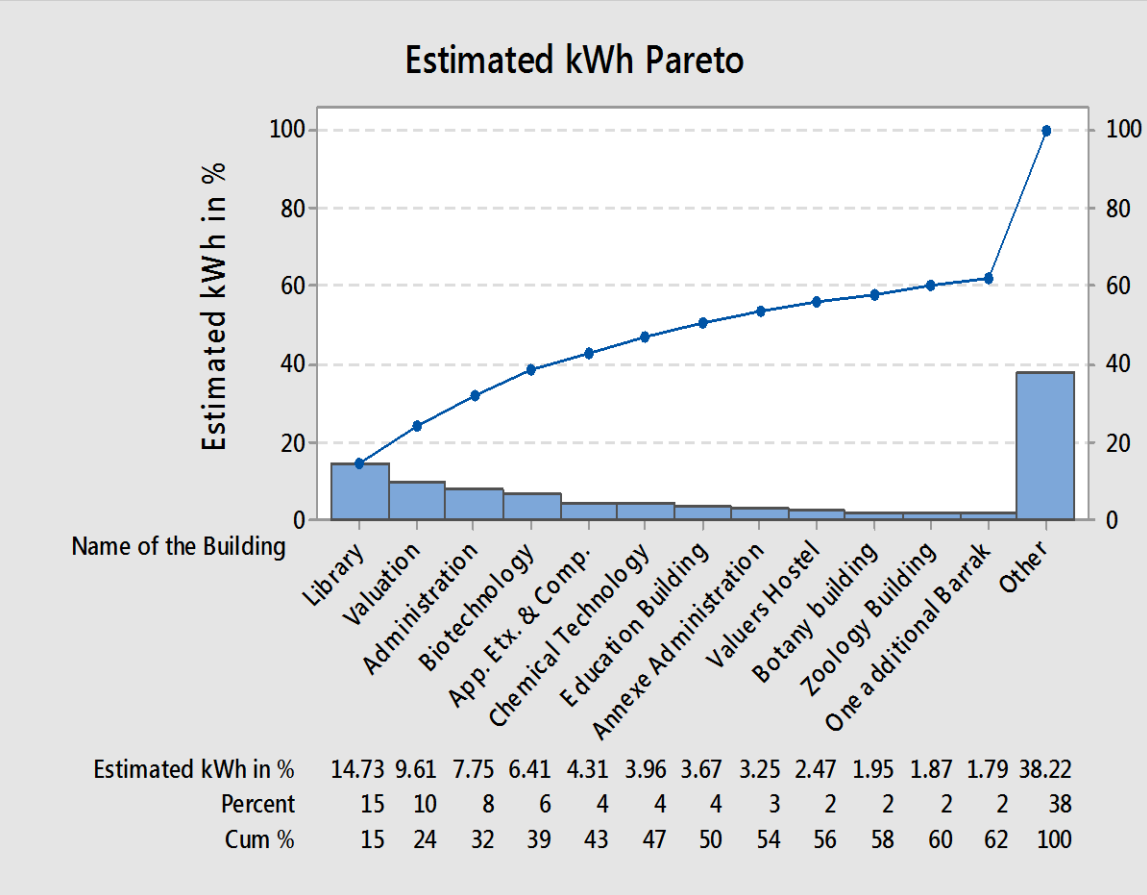
PPS Energy Solutions Pvt. Ltd. has conducted the detailed energy audit from 04-Jul-16 to 13-Oct-2016.

This study covers the energy efficiency improvement opportunities in Sant Gadge Baba Amravati University. :

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

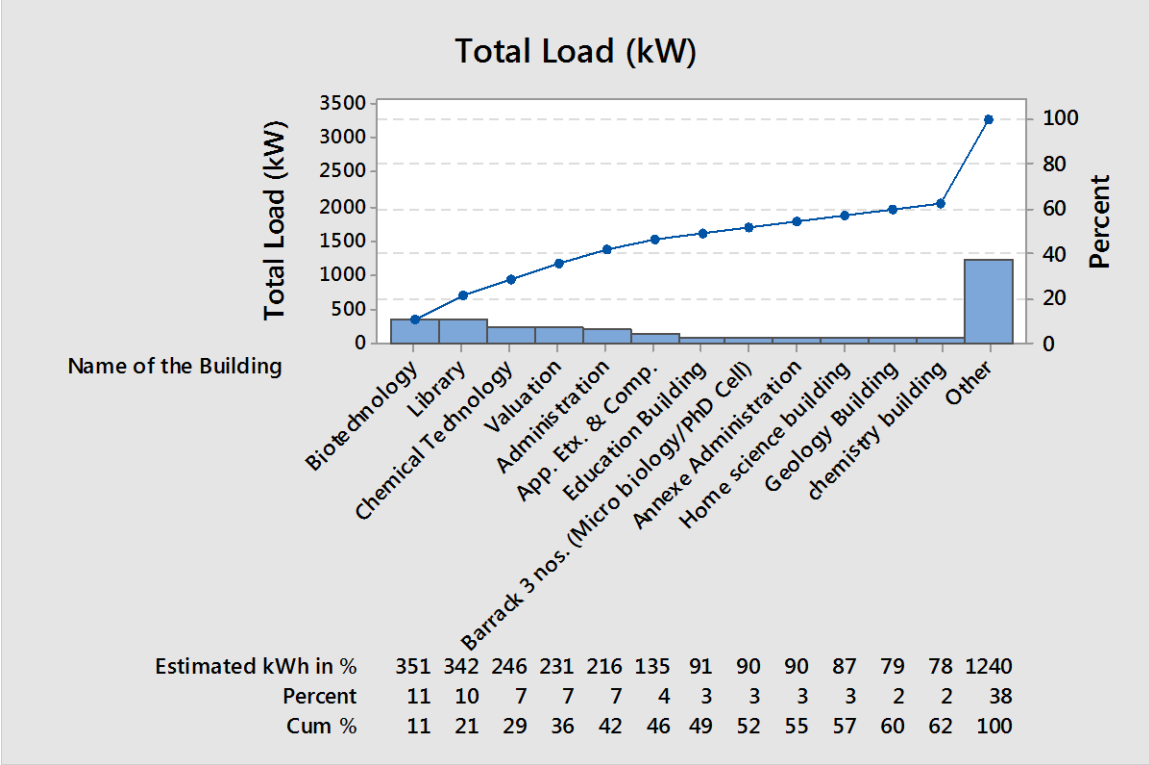
1) Lightings load
2) Air conditioners
3) Pumps
4) Computers
5) Ceiling fans
6) Laboratory machines/equipments

Pareto based on estimated monthly kWh consumption:



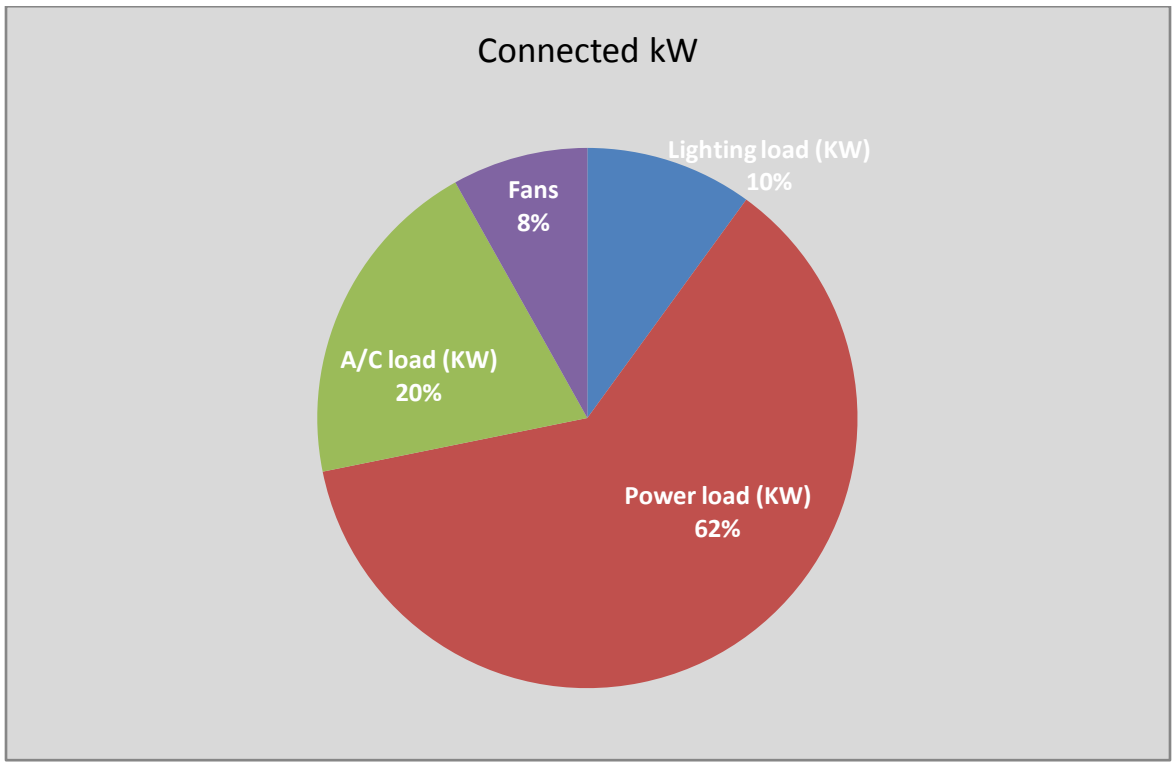
Estimated kWh in %	14.73	9.61	7.75	6.41	4.31	3.96	3.67	3.25	2.47	1.95	1.87	1.79	38.22
Percent	15	10	8	6	4	4	4	3	2	2	2	2	38
Cum %	15	24	32	39	43	47	50	54	56	58	60	62	100

Pareto based on estimated connected load kW:



Estimated kWh in %	351	342	246	231	216	135	91	90	90	87	79	78	1240
Percent	11	10	7	7	7	4	3	3	3	3	2	2	38
Cum %	11	21	29	36	42	46	49	52	55	57	60	62	100

Pie chart based on appliances category wise connected load:



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

Name of the Building
Consolidated Library
Valuation building
Administration Building
Biotechnology
Applied electronics and Computer Building
Chemical Technology
Education Building
Annexe Administration Building
Valuer's Hostel
Botany building
Zoology Building
One additional Barak (Mathematics/ Statistics/Migration dept)

Also based usage pattern from appliances point of view, ceiling fans and T12 tube lights having highest energy savings potential.

Hence, based on above analysis Library building and Valuation building are selected for implementation of energy efficiency program.

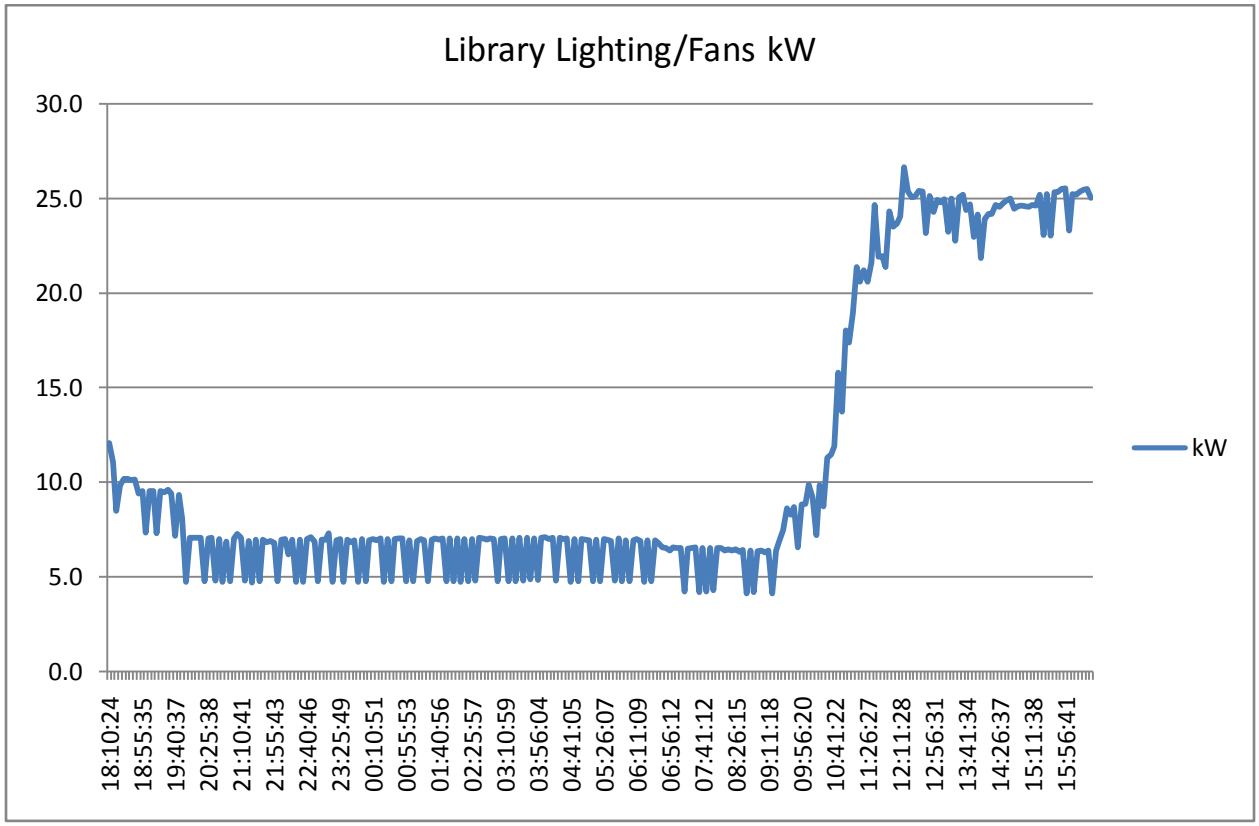
Load data of these buildings is as follows:

Consolidated Building Wise Existing load				
Sr. No.	Appliance	Appliances	Valuation building	Library Building
		Meter No.1	1K079501	1K 079514
		Meter No.2		1387964
		Meter No.3		
1	Fan	Ceiling Fan	536	439
2		Exhaust Fan	47	38
3		Bracket Fan	18	214
4		Cabin Fan	1	1
5		Other -	0	0

Consolidated Building Wise Existing load				
Sr. No.	Appliance	Appliances	Valuation building	Library Building
1	Air Conditioner	Windows A/C (1.5 Ton)	0	0
2		Windows A/C (2 Ton)		0
3		Air Conditioner (SS) (1.5 Ton)	3	2
		Air Conditioner (SS) (2 Ton)	11	13
4		Air Conditioner (MS) (3 Ton)	0	0
5		Air Conditioner (D) (5.5 Ton)	2	0
6		Air Conditioner (D) (8.5 Ton)	0	6
7		Air Conditioner (Cassette) (2 Ton)	0	0
8		Air Cooler	60	7
9		Other -	0	0
1	Lighting	Tube Light 1 x 40 W	767	706
2		Tube Light 2 x 40 W	18	11
3		CFL DL 1 x 11 W	0	4
4		CFL DL 2 x 11 W	0	0
5		CFL DL 2 x 36 W	0	0
6		CFL INT 11 W	0	2
7		CFL INT 5 W	0	0
8		CFL SL 1x 36 W	0	0
9		MV 125 W	0	1
10		MH 70 W	0	0
11		MH 150 W	4	0
12		MH 250 W	13	0
13		Other -	17	81

Consolidated Building Wise Existing load				
Sr. No.	Appliance	Appliances	Valuation building	Library Building
	UPS (In- ph , out-ph)	UPS 3 kVA	0	3
1		UPS 5 kVA	4	6
2		UPS 10 kVA (1 Ph)	0	0
3		UPS 10 kVA (3 Ph)	0	0
4		Other -	2	0
1	Equipments	Computer	82	128
2		Printer	22	26
3		Xerox M/C	4	1
4		Scanner	12	16
5		Other -	7	12
1	Other Units	Motor (1Ph)	0	0
2		Motor (3Ph)	1	0
3		Geyser	0	0
4		Water Cooler	5	4
5		Other -	0	0
	Load Detail	Fan load (KW)	38	43
1		Lighting load (KW)	36	34
2		Power load (KW)	108	82
3		A/C load (KW)	48	111
4		Total load (KW)	231	270

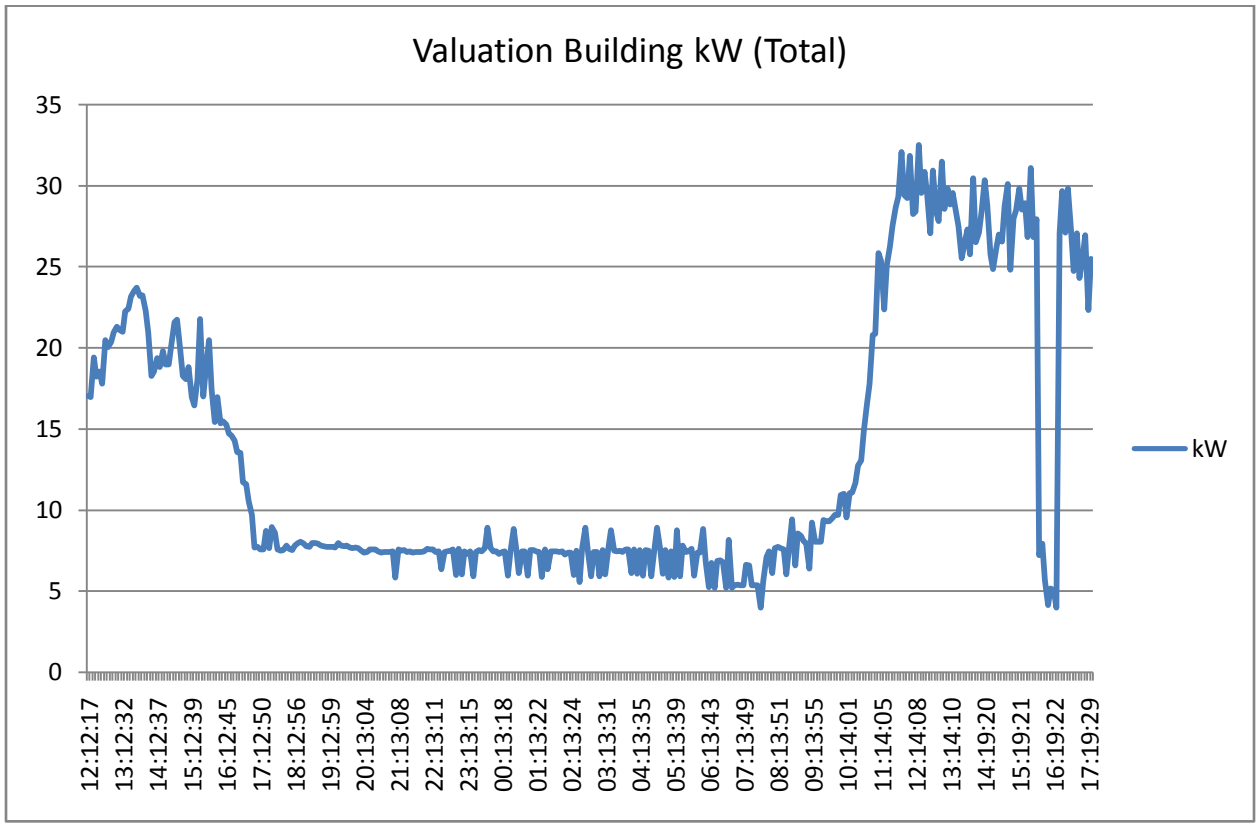
Library Building (Lighting and fan) running kW over time:



Note: Load data is taken during 30-Sep-16; 06:10 pm (Friday) to 01-Oct-16; 04:31 pm (Saturday)

	V	A	PF +ind -cap	kW	VA	var
Min	383	6	0.871	4.12	4.22	0.90
Max	410	44	0.982	26.66	29.31	12.36
Average	399	18	0.913	11.16	12.29	5.08

Valuation Building running kW over time:



Note: Load data is taken during 02-Oct-16; 12:12 pm (Sunday) to 03-Oct-16; 05:24 pm (Monday)

	V	A	PF +ind -cap	kW	VA	var
Min	395	7	0.705	3.98	4.62	2.07
Max	415	53	0.894	32.52	36.61	17.62
Average	406	22	0.817	12.79	15.21	8.14

The major savings are observed in following areas:

1) Replacement of Tubular Fluorescent Lights with more efficient LED lamps.
2) Replacement of old ceiling fans and regulators with new high efficiency fans (super fans)

The detailed feasibility study of the above-mentioned savings is elaborated in next section.

3. Financial feasibility of recommendations

3.1. Replacing Tube Light fittings with 22W LED Tubes

There are around 40W 1531 Nos. of Tube lights. It is recommended to replace 1200 nos. of tube lights, which are having working hours 8 hr/day or more in a day.

Particular	Unit	Value
Existing No. of tube lights (T12)	No.	1531
No. of tube lights to be replaced (1st phase)	No.	1200
Power consumption by each tube light fitting with ballast	W	52
Power consumption by new LED tube lights	W	22
Energy savings by replacement	W	30
Operating hrs/year	Hrs/year	2400
Yearly savings	kWh	86400
Unit Rate	Rs./kWh	8
Annual Saving	**Rs Lakh/year**	**6.91**

Financial Feasibility

Saving achieved after project implementation = Rs. Lakh 6.91

Capital Investment required for the proposed Project is given in the following table

Short Description of Item of Work	Qty (Nos.)	Rate (Rs/Unit)	Amount (Rs Lakh)
Supplying and erecting ready to use retrofit T12 LED of 20-22W tube light with heat sink, integrated HF electronic driver complete $ compatible to T12 (40W) luminaries by disconnecting starter & ballast if necessary.	1200	1400	16.80

Simple Payback period: 2.4 years

The tube light (LED) should carry warranty of 03 years.

3.2. Replacing Old fans by five star rated energy efficient fans (Super fans)

There are 975 No. of ceiling fans. These fans having higher operating hours and may be replaced by Five Star rated Energy Efficient fans (Super fans), which consume less than 35 W. It is proposed to replace around 600 No. of old fans, which are having more than 8 hrs/day operating duration. The savings estimated are as below:

Particular	Unit	Value
No. of fans without star rating	Nos.	975
No of fans to be replaced	Nos.	600
Estimated Wattage of existing fans	Watts	70
Estimated wattage of energy efficient fan	Watts	35
Operating Hrs per year	hrs/day	2400
Estimated Saving	kWh/year	50400
Unit Rate	Rs/kWh	8
Annual Saving	**Rs. Lakh/year**	**4.0**

Financial Feasibility

Saving achieved after project implementation = Rs Lakh 4.00

Capital Investment required for the proposed Project is given in the following table

Short Description of Item of Work	Qty (Nos.)	Rate (Rs/Unit)	Amount (Rs Lakh)
Supplying and erecting Five Star Rated (Super Fan) Energy Saving Ceiling Fan 230 V A.C. 50 Hz, 1200 mm complete erected in position	600	2300	13.80
Dismantling the existing ceiling fan complete with accessories, G.I. down rod, frame etc. and making the site clear.	600	24	0.14
Supplying and erecting electronic type step regulator for ceiling fan 1200.	600	175	1.05
Total	**600**	**2499**	**14.99**

Simple Payback period = 3.7 years

4. Conclusion

- The total estimated savings is to the tune of 136800 (kWh/year)
- Following Action is suggested to achieve the said potential savings:

Sr. No.	Equipment Name	ECM Details	Investment (Rs. in Lakh)	Savings (kWh/year)	Saving (Rs. in Lakh / Year)	Payback (Years)
1	Tube Lights	Replacement of 40 Watt Tube lights with LED tube lights	16.80	86400	6.91	2.4
2	Fans	Replacement of existing old (without star rating) fans with 5 star rated energy efficient fans (super fans)	15.00	50400	4.03	3.7
Total			**31.800**	**136800**	**11**	**2.9**

If all the projects are implemented and actions are taken on replacement of ceiling fans and tube lights, the total project bundle economics are good.

A total Investment of Rs. Lakh 31.80/- is estimated for the energy efficiency improvement projects.

Hence, total assistance of Rs. 25, 00,000 (Rs. Twenty-five lakh only) is requested from MEDA under the energy efficiency improvement programme in Government buildings to implement these projects.