Sep, 2020 Confidential

ENERGY AUDIT REPORT

OF

JK Lakshmipat University
Mahapura, Ajmer road,
Jaipur

Prakash Engineers & Consultant JAIPUR

ACKNOWLEDGEMENT

We feel inspired to notify our inexplicable gratitude from heart to Sh. K. K. Maheshwari, officiating Registrar and Sh. Praveen Kumar Verma, GM Administration who is visualized the idea of identifying possible energy saving potential. Our sincere thanks to the incessant and infallible motivation emanated from the desk of Shri Narendra Sharma, JEN who rendered their best possible support to us. Last but definitely not the least, we express our profound thanks to staff of JK Lakshmipat University for their best efforts & assistance extended to the auditing team.

FOR

Prakash Engineers & Consultant.

Mr. Rajeev Jain

(Energy Auditor)

Dated : 22/09/2020

The team members are: -

1. Dr. R. Chedwal, LEED Auditor
2. Shri R. K. Jain, Certified Energy Auditor of BEE(EA-1299)
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FOR

Prakash Engineers & Consultant.

Mr. Rajeev Jain

(Energy Auditor)

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EXECUTIVE SUMMARY

S. No.	Description	Potential Electrical Savings	Potential Savings in Rs./yr	Cost of implement ation	Simple payback period in years	Remarks
1	Install occupancy sensors in 5 rooms	938 Units	Rs. 8442/-	Rs. 25,000/-	2.9 years	-
2	Decrease contract demand from 650 kVA to 600 kVA.		Rs. 121500/-	Nil	Immediate	-
3	House Keeping Measures	5000 units	Rs. 45000/-	Nil	Immediate	-

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1. INTRODUCTION

Established in 2011, JK Lakshmipat University (JKLU) is located in the historic city of Jaipur; Rajasthan the University is located on the Jaipur- Ajmer National Highway near Mahindra SEZ, P.O. Mahapura Ajmer Road. Supported by the JK Organization- 125 years old legacy of contributions to nation-building, the JKLU is passionate about building the country's most innovative higher education institution. The 30-acre campus is a modern, environmentally conscious and inviting space designed to help students live, work and play in a setting that is safe, productive and student-centric. Mainly campus is divided in following blocks

i) Admin Block

ii) MDC Block (Guest house)

iii) MBA Block

iv) Engg. Block -1

v) Engg. Block -2(Lab Block)

vi) LRC block (Library)

vii) Boys and girls hostel

viii) Flats

Energy Sources

Electricity is the only source of energy used at university. The incoming supply is at 33 kV and there is one transformer of 2000 kVA of Kirloskar make installed. DG set of 250 kVA and 630 kVA of Cummins make (sudhir) have been provided for backup supply. Alternate source of energy i.e., Solar water Heater Installed at MDC & Mess. Renewable source of energy through 400 kW grid connected solar PV plant installed at roofs of various block.

Electricity Supply

The contract demand is 650 kVA and the demand charge is @ Rs. 270 per kVA. The present energy charges are Rs. 8.85/KWH.

Audit Objective & Scope

The broad objective of Energy Audit is to review the present energy consumption scenario, monitoring and analysis of the use of energy and explore the energy conservation options at UNIVERSITY, including submission of a detailed audit report containing recommendations for improving energy efficiency with the cost benefit analysis and technical specifications for any retrofit options with the list of suppliers/ manufacturers of energy efficient technologies. The scope covers Electrical distribution system, lighting system, HVAC system, DG sets, water pumping system & Energy monitoring and accounting system cost benefit analysis of each ENCON options etc.

Since there is no boilers/thermic fluid heaters at UNIVERSITY and hence this have not been covered in this DPR.

Major Energy Use and Areas

Major energy consumption at UNIVERSITY is for packaged air conditioning, lighting, and computer system/server through UPS and for miscellaneous load like fans, water coolers, photocopiers, fax machines and the machines in labs.

2. ELECTRICAL DISTRIBUTION SYSTEM

Metering: The connection type is HT at 33 kV and there are electrical metering rooms at HT side of the transformer. The contract demand is 650 kVA. The applicable tariff rate is Rs. 8.85 per kWh the demand charges are Rs. 270 kVA/month. A study of power consumption of last months has been done and is placed below.

S. No.	Month	Net Unit imported from JVVNL	Units Generated from DG	Units Generated from Solar	Total Units consumed
1	Jul-19	93,168	63.00	42,884	**1,36,115**
2	Aug-19	1,04,820	97.00	40,625	**1,45,542**
3	Sep-19	1,16,448	13.00	43,322	**1,59,783**
4	Oct-19	60,396	400.00	43,446	**1,04,242**
5	Nov-19	47,364	-	32,879	**80,243**
6	Dec-19	24,768	70.00	36,113	**60,951**
7	Jan-20	37,392	544.00	33,798	**71,734**
8	Feb-20	24,696	71.00	39,677	**64,444**
9	Mar-20	(96)	-	50,744	**50,648**
10	Apr-20	(14,832)	-	54,706	**39,874**
11	May-20	(4,152)	-	56,439	**52,287**
12	Jun-20	21,396	165	49,840	**71,401**
13	Jul-20	26,304	1,500.00	44,552	**72,356**
	Total	**5,37,672**	**2,923**	**5,69,025**	**11,09,620**

The SF6 breaker is used at HT sides of transformer. log books need to be maintained here for voltage and loading on different feeders. Although the silica gel filled in breathers of transformers are blue in color which show that the maintenance is properly done.

voltage and current. These can be measured with the help of advanced electrical measuring instruments.

Many problems can arise from harmonic currents in a power system. Some problems are easy to detect whereas others exist and persist because harmonics are not suspected. These include over-heating of neutral conductors/motors/ transformers/switch gears, voltage drop, low power factor, reduced capacities, capacitor failure, circuit breaker tripping, fuses blowing with no apparent reason etc. These problems do not lead to increased electricity bill but are operational and maintenance concerns.

Harmonics can be suppressed using Tuned Harmonic Filters, which consist of a capacitor bank and reactor in series by providing low impedance path for harmonic component. The Harmonic filters connected suitably near the equipment generating harmonics help to reduce Total Harmonic Distortion to acceptable limits.

By instant meters we checked and found that harmonics are within the range.

3. Lighting System:

Lighting is an essential service at all the building complexes. The power consumption at UNIVERSITY for lighting is varying around 25% of the total power consumption. Innovation and continuous improvement in the field of lighting has given tremendous energy saving opportunities in this area. A comprehensive light load survey was carried out, the details of which have been included in this DPR. Nearly 50% of the conventional lights (T5, CFL, bulbs) have been replaced by LEDs. It is suggested that all lights should be replaced by LEDs.

Review of Present Lighting System:

Energy efficient lighting has been used at UNIVERSITY at every place. Nearly all tube lights are of T5 (28 W) and CFL type.

The lighting inventory at UNIVERSITY (Interior) is shown in the tables below:

We have done the measurement of lux in various rooms of all the blocks. In some of the places we have found the lighting intensity is sufficient. The UNIVERSITY office is having ample natural light.

Lighting Load Survey

Using the **lux** meters, light load survey was carried out at various rooms and various floors of the entire building. In addition to this, dimensions of the rooms and mountings height of the light fittings were also taken so as to find out Room Index (RI), Lumens per watt, Lux/sq. meters etc. and these are compared with the standards. The lux level and wattage found satisfactory.

Admin Block

S.no	Watt	No. Of Light	Total (Watt)	Model	Type
1	28	16	448	1*28W	GF
2	72	30	2160	2*36W	GF
3	36	40	1440	2*18W	GF
4	52	10	520	2*26W	GF
5	84	30	2520	2*42W	GF
6	26	3	78	2*13W	GF
7	36	65	2340	2*18W	FF
8	72	8	576	2*36W	FF
9	26	3	78	2*13W	FF
10	52	14	728	2*26W	SF
11	18	9	162	1*18W	SF
12	56	4	224	2*28W	SF
13	36	5	180	2*18W	SF
14	22	6	132	2*11W	SF
15	26	1	26	2*13W	SF

MBA Block

S.no	Watt	No. Of Light	Total (Watt)	Model	Type
1	56	2	112	2*28W	GF
2	72	10	720	2*36W	GF
3	36	57	2052	2*18W	GF
4	52	21	1092	2*26W	GF
5	18	1	18	1*18W	GF
6	26	2	52	2*13W	GF
7	56	27	1512	4*14W	GF
8	56	38	2128	4*14W	FF
9	36	32	1152	2*18W	FF
10	56	13	728	2*28W	FF
11	18	5	90	1*18W	SF
12	36	56	2016	2*18W	SF
13	72	54	3888	2*36W	SF
14	28	1	28	1*28W	SF
15	22	32	704	2*11W	SF

LRC Block

S.no	Watt	No. Of Light	Total (Watt)	Model	Type
1	56	67	3752	2*28W	GF
2	72	22	1584	2*36W	GF
3	36	23	828	2*18W	GF
4	28	2	56	1*28W	GF
5	13	17	221	1*13W	GF
6	26	2	52	2*13W	GF
7	56	45	2520	2*28W	FF
8	22	16	352	2*11W	FF
9	28	1	28	1*28W	FF
10	72	40	2880	2*36W	GF

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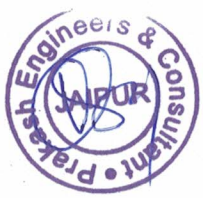
MDC Block

S.no	Watt	No. Of Light	Total (Watt)	Model	Type
1	22	12	264	2*11W	GF/FF/SF
2	36	136	4896	2*18W	GF/FF/SF
3	72	4	288	2*36W	GF/FF/SF
4	56	6	336	2*28W	GF
5	26	31	806	2*13W	GF/FF/SF
6	50	23	1150	1*50W	GF/FF/SF
7	40	23	920	1*40W	GF/FF/SF
8	52	6	312	2*26W	GF/FF/SF
9	26	23	598	1*26W	GF/FF/SF
10	56	12	672	4*14W	GF/FF/SF

IET-1

S.no	Watt	No. Of Light	Total (Watt)	Model	Type
1	22	23	506	2*11W	B
2	56	28	1568	2*28W	B
3	72	29	2088	2*36W	B
4	36	48	1728	2*18W	GF
5	72	63	4536	2*36W	GF
6	56	4	224	2*28W	GF
7	13	13	169	1*13W	GF
8	36	80	2880	1*28W	SF
9	28	21	588	1*28W	SF



S.no	Watt	No. Of Light	Total (Watt)	Model	Type
1	22	9	198	2*11W	B
2	36	4	144	1*18W	B
3	72	12	864	2*36W	B
4	28	40	1120	1*28W	B
5	36	11	396	1*18W	GF
6	13	14	182	1*13W	GF
7	26	4	104	2*13W	GF
8	72	72	5184	2*36W	GF
9	28	2	56	1*28W	GF
10	72	78	5616	2*36W	FF
11	36	11	396	1*18W	FF
12	22	32	704	2*11W	FF
13	26	4	104	2*13W	FF
14	13	14	182	1*13W	FF
15	36	12	432	1*18W	SF
16	13	14	182	1*13W	SF
17	26	4	104	2*13W	SF
18	72	90	6480	2*36W	SF
19	28	4	112	1*28W	SF

4. Air Conditioning System

The AC installed in campus is Ducting / spilt type. It is observed that the maintenance of AC units will be required. Some filters are not cleaned and gas pressure need to be checked. The cold lines (from outdoor unit to indoor unit) of some of the AC's are not insulated.

It is suggested that maintenance of AC should be done regularly.

Details of Duct able (packaged) air conditioning units are as under:

S.no	Capacity (TR)	No. Of Unit	Total (TR)	Type/Model	Floor	Make	Current Cooling Area
Admin Block							
1	8.50	1	8.5	Ductable	GF	LG	Establishment, Estate & Project Office
2	4.25	1	4.25	Ductable	GF	LG	Dy. Registrar Office, CFO
3	1.50	1	1.5	Ductable	FF	LG	Registrar Office
4	3.00	1	3.0	Ductable	FF	LG	VC Office Area/Lounge
5	4.25	1	4.25	Ductable	FF	LG	Chancellor Office
6	3.00	1	3.0	Ductable	FF	LG	Vice Chancellor Office
7	4.25	1	4.25	Ductable	FF	LG	Board Room
8	2.00	1	2.0	Ductable	FF	LG	Mini Board Room
9	2.50	1	2.5	Ductable	SF	LG	DY.Registrar Exam Officer (204)
10	1.50	1	1.5	Ductable	SF	LG	Lounge (205)
		10	**34.75**				
MDC Block							
1	8.50	1	8.5	Ductable	GF	LG	Training Room-1
2	8.50	1	8.5	Ductable	GF	LG	Training Room-2
3	4.25	1	4.25	Ductable	GF	LG	Lounge
4	2.00	1	2.0	Ductable	GF	LG	Co-Orparate manager Office
5	4.25	1	4.25	Ductable	GF	LG	Dining Hall
6	2.00	4	8	Ductable	FF	LG	2x4 (room no.101 to 104)
7	1.50	6	9	Ductable	FF	LG	1.5x5(room no.105 to 110)
8	2.00	4	8	Ductable	SF	LG	2x4 (201, 202,213,214))
9	1.50	9	13.5	Ductable	SF	LG	(1.5x 9) Room no. 203 to 211
		28	**66.0**				
MBA Block							
1	2.00	1	2	Ductable	GF	LG	Room no. 001 (Server room)
2	4.25	1	4.25	Ductable	GF	LG	Tutorial (002)
3	8.50	2	17	Ductable	GF	LG	Amphitheatre (8.5x2)003
4	4.00	1	4	Ductable(VRV)	GF	Daikin	Account Section 005
5	4.25	1	4.25	Ductable	GF	LG	Placement Office 006
6	1.50	1	1.5	Ductable	GF	LG	Record Room 007
7	2.00	1	2.0	Ductable	GF	LG	Director IM
8	3.00	1	3.0	Ductable	GF	LG	Conference Room
9	8.50	1	8.5	Ductable	FF	LG	Class Room 1 (101)
10	4.25	1	4.25	Ductable	FF	LG	Tutorial 1 (102)
11	4.25	1	4.25	Ductable	FF	LG	Tutorial 2 (103)
12	4.25	1	4.25	Ductable	FF	LG	Tutorial 3 (104)
13	8.50	1	8.5	Ductable	FF	LG	Class Room 2 (105)
14	8.50	1	8.5	Ductable	FF	LG	Class Room 3 (106)
15	3.00	1	3.0	Ductable	SF	LG	Lounge (201)
		16	**79.25**				
Eng. Block -1							
1	5.5	2	11	Ductable	B	LG	Design Studios(B001)

2	4.25	1	4.25	Ductable	GF	LG	Tutorial (001)
3	3.00	1	3.0	Ductable	GF	LG	Placement Office 002
4	3.00	1	3.0	Ductable	GF	LG	Admin Office 003
5	3.00	1	3.0	Ductable	GF	LG	Director IET 004
6	4.25	1	4.25	Ductable	GF	LG	Conference Room 005
7	8.50	1	8.5	Ductable	GF	LG	Class Room 007
8	8.50	2	17.0	Ductable	GF	LG	Amphitheatre (8.5x2)
9	8.50	2	17.0	Ductable	FF	LG	Class room (101&102)
10	5.50	1	5.5	Ductable	FF	LG	Tutorial -105
11	8.50	2	17.0	Ductable	FF	Hitachi	Class room (103&104)
		15	**93.5**				
Lab Block (EB -2)							
1	4.25	1	4.25	Ductable	GF	LG	Multimedia
2	5.50	1	5.5	Ductable	GF	LG	C++ Lab
3	8.50	1	8.5	Ductable	GF	LG	Class Room. No. 004
4	5.50	2	11	Ductable	GF	LG	Class Room. No. 005 (5.5x2)
5	8.50	1	8.5	Ductable	GF	LG	Class Room. No. 006
6	5.50	1	5.5	Ductable	GF	LG	Class Room. No. 006
7	5.50	1	5.5	Ductable	Basement	Hitachi	Class Room. No. B007
8	8.50	1	8.5	Ductable	FF	Hitachi	Class Room No 104
9	5.50	2	11	Ductable	FF	Hitachi	Class Room No 105 (5.5 x 2)
10	8.50	1	8.5	Ductable	FF	Hitachi	Class Room No 106
11	5.50	1	5.5	Ductable	FF	Hitachi	Class Room No 106
12	5.50	1	5.5	Ductable	SF	Hitachi	Tutorial (201)
13	8.50	1	8.5	Ductable	SF	Hitachi	Class Room 202
14	5.50	2	11	Ductable	SF	Hitachi	Class Room 204 (5.5x2)
15	5.50	2	11	Ductable	SF	Hitachi	Class Room 205 (5.5x2)
16	8.50	1	8.5	Ductable	SF	Hitachi	Class Room No. 206
17	5.50	1	5.5	Ductable	SF	Hitachi	Class Room No. 206
		21	**132.25**				
LRC Block							
1	5.5	1	5.5	Ductable	GF	Hitachi	Computer Lab -1
2	5.5	1	5.5	Ductable	GF	Hitachi	Computer Lab -2
3	5.5	1	5.5	Ductable	GF	Hitachi	Computer Lab -3
4	5.5	1	5.5	Ductable	GF	Hitachi	Research Lab
5	11.0	1	11	Ductable	GF	Hitachi	Librarian & News Magazine
6	11.0	1	11	Ductable	GF	Hitachi	Reference Section
7	16.5	1	16.5	Ductable	GF	Hitachi	Reading Section
8	16.5	1	16.5	Ductable	FF	Hitachi	Reading Section

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Details of spilt(wall mount) air conditioning units are as under:

S.no	Capacity (TR)	No. Of Unit	Total (TR)	Type/Model	Floor	Make	Currently Cooling Area
Admin Block							
1	1.5	1	1.5	Hi-wall/RSM318HDDO	SF	Hitachi	Server Room (25-06-2020)
2	1.5	1	1.5	Hi-wall/RAU317KWD	GF	Hitachi	Dy. Registrar HR
3	1.5	2	3.0	Hi-wall/RAU317KWD	SF	Hitachi	Call Centre
4	4.0	1	4.0	Tower AC	GF	Midea	Reception
		5	**10.0**				
MBA Block							
1	1.5	26	39	Hi-wall/LSA5AT3M	SF	LG	Faculty Chamber 202 to 227 (1.5x26)
2	1.5	1	1.5	Hi-wall/RAU317KWD	GF	Hitachi	Server Room
		27	**40.5**				
Eng. Block -1							
1	1.5	11	16.5	Hi-wall/RAC318KTD	SF	Hitachi	Faculty Chamber (201 to 218)
2	1.0	1	1.0	Hi -wall/RAC511KTD	SF	Hitachi	Faculty Chamber
3	1.5	15	22.5	Hi -wall/RAC511KTD	SF	Hitachi	Faculty Chamber (220 to 241)
		27	**40.0**				
Lab Block (EB -2)							
1	2	1	2	Hi-wall/LSA6P3F	Basement	LG	Server Room
2	1	1	1	Hi-wall 3 star	Basement	Bluestar	IOD
3	4.0	1	4.0	Tower AC	Basement	Midea	IOD class room
		3	**7**				
LRC Block							
1	1.5	5	7.5	Hiwall/RAC318KSDI	GF	Hitachi	Server Room
Boys Hostel 1st							
1	1.5	22	33	Hi- wall/183 Eyu Split 3 star	GF,FF	Voltas	Room no.03 to 09,101 to 108, 110 to 116

2	1.5	6	9	Hi- wall/183 Eyu Split 3 star	SF	Voltas	Room no. 201 to 206
		28	**42**				
Boys Hostel 2nd							
1	1.5	22	33	Hi- wall/183 Eyu Split 3 star	GF,FF,SF	Voltas	Room no.06 to 09, 101 to 108, 210 to 216
Girls Hostel							
1	1.5	3	4.5	Hi- wall/183 Eyu Split 3 star	TF	Voltas	Room no. 301 to 304
2	1.5	7	10.5	Hi- wall/183 Eyu Split 3 star	FF	Voltas	Room no. 101C,101D, 102C, 102D,103C, 104C,104D
3	1.5	5	7.5	Hi- wall/183 Eyu Split 3 star	FF,SF	Voltas	Room no. 202D,203D, 202C, 203C,204D
4	1.5	7	10.5	Hi- wall/RSNS318HCDO Split 3 star	GF,TF	Hitachi	Room no. 301 to 304 and 003
		22	**33**				
Flats							
1	1.5	4	6	Window AC	GF/FF	Hitachi	VC bungalow
2	1.5	3	4.5	Hi- wall/183 Eyu Split 3 star	GF/FF	Daikin	VC bungalow
3	1.5	1	1.5	Hi- wall/183 Eyu Split 3 star	GF	Voltas	Health centre
4	1.5	2	3	Window AC	GF	Samsung	Warden office (Hostel 1st &2nd)
5	1.5	3	4.5	Window AC	GF	Samsung	GYM

5. Other Electrical Appliances

Following are the other electrical appliances in use at UNIVERSITY:

1. Water coolers – 28 no's.
2. Refrigerators – 5 no's.

Numbers of office equipments are being used by the UNIVERSITY. These include photocopiers, fax machines, computer systems, printers etc. Nearly 283 computers, 15 Photostat Machines and printers are used in campus.

Details of pumps and motors are as under:

S. No.	ITEM	RATING	MAKE	Qty.
		STP		
1	BLOWER 1	3HP	AIRVAK/C&G	1
2	BLOWER 2	3HP	AIRVAK/C&G	1
3	MOTOR 3PHASE 1	3HP	GRUNDFOS	1
4	MOTOR 3PHASE 2	3HP	GRUNDFOS	1
5	MOTOR 3PHASE 1	1HP	KIRLOSKAR	1
6	MOTOR 3PHASE 2	1HP	KIRLOSKAR	1
7	MOTOR 3PHASE 3	3HP	KIRLOSKAR	1
8	MOTOR 3PHASE 1	1HP	KIRLOSKAR	1
		Pump Room		
1	MOTOR 3 PHASE 1	7.5KW	ROTOMOTIVE	1
2	MOTOR 3 PHASE 2	7.5KW	ROTOMOTIVE	1
3	MOTOR 3 PHASE 1 (Filter feed pump)	3HP	KIRLOSKAR	1
4	MOTOR 3 PHASE 2 (Filter feed pump)	3HP	KIRLOSKAR	1
5	MOTOR 3 PHASE (Jockey)	25KW	KIRLOSKAR	1
6	MOTOR 3 PHASE (Hydrant)	75KW	KIRLOSKAR	1
7	FIRE ENGINE	85HP	KIRLOSKAR	1
8	DISEL ENGINE	8 HP	KIRLOSKAR	1
		Bore well		
1	BORE WELL NO. 2	3 HP	Texmo	1
2	BORE WELL NO. 3	5 HP	CRI	1
3	BORE WELL NO. 4	3 HP	Texmo	1
4	BORE WELL NO. 6	3 HP	Texmo	1
5	BORE WELL NO. 7	5 HP	CRI	1
		Lift		
1	Boys Hostel 1st	5.5 KW	Thyssen Krupp	1
2	Boys Hostel 2nd	5.5 KW	Thyssen Krupp	1
3	2 BHK	5.5 KW	Thyssen Krupp	1
4	3 BHK	5.5 KW	Thyssen Krupp	1
5	MDC	9 KW	Thyssen Krupp	1
		Geyser		
1	MDC GF	35 Ltr.	Venus	1

2	MDC FF	25 ltr.	Venus	10
3	MDC SF	15 ltr.	Hindware	13
4	Boys Hostel 1st	35 lLtr.	Venus	26
5	Boys Hostel 2nd	35 lLtr.	Venus	26
6	Girls Hostel	35 lLtr.	Venus	28
Monoblock Pump (1 Phase)				
1	MBA	1 HP	Crompton Greaves	1
2	LRC	1 HP	Crompton Greaves	1
3	IET 1st	1 HP	Crompton Greaves	1
4	IET 2nd	1 HP	Crompton Greaves	1
5	New Lab	1 HP	Crompton Greaves	1

But it is suggested that photo copier and printers should be switched off when not used for a longer time or when leaving the office after office hours, because they consumes small amount of electrical power in idle position or in energy saving mode.

6. RECOMMENDATIONS ON ENERGY SAVING MEASURES

Based on the energy audit carried out, following Energy Saving Measures are hereby recommended for implementation:

RECOMMENDATION NO. - 1

A. Title of Recommendation	:	Install occupancy sensors in 5 rooms.
B. Description of Existing System and its operation	:	Presently there is no occupancy sensor in the rooms of members and in cabins of senior officers.
C. Description of Proposed system and its operation	:	The sensors operating on the basis of presence detection by Passive Infra Red (PIR technology). Load switches "ON" in case of human occupancy in the room and switches OFF in case of NON- Occupancy.
D. Energy Saving Calculations		
Average non occupancy for each room	=	2 hours/day

Average use days of the room	=	250 days/year
Average power consumption of room without occupancy sensor.	=	3000 Watts/day
Average Power saving with occupancy sensor		750 watts/day
No. of occupancy sensor proposed at UNIVERSITY	=	5
E. Cost Benefits		
Annual Energy Saving Potential	= =	750 X 250 X 5 /1000 Units 938 Units
Annual Cost Savings @ Rs. 9/- unit	=	Rs. 8442/-
Investment	=	5 units @ Rs. 5000/- per occupancy sensor = Rs. 25,000/-
Simple Payback period	=	2.9 years

RECOMMENDATION NO. - 2

A. Title of Recommendation	:	Decrease contract demand from 650 kVA to 600 kVA.
B. Description of Existing System and its operation	:	Presently the demand charges are Rs. 270 per kVA and Contract demand is 650 kVA
C. Description of Proposed system and its operation	:	It is proposed to decrease from 650 kVA to 600 kVA as going through last one year electricity bills the maximum demand recorded is 400 kVA. To remain on safer side the contract demand may be reduce by 50 kVA.
D. Energy Saving Calculations		
Demand charges Rs. 270 per kVA per month	=	Need to pay 75% of 600kVA (ie 450 kVA) instead 75% of 650 kVA(487.5 kVA) saving of 37.5 kVA 270*37.5=Rs. 10125 per month
E. Cost Benefits		
Annual Saving Potential	=	12X10125 = Rs 121500/- per annum
Investment	=	Nil
Simple Payback period	=	Immediate

7. HOUSE KEEPING MEASURES:

These are the recommendations which require no investment and only corrective actions are needed to reduce the power bill:-

1. Since the orientation of all blocks of university is north to south and there be ample natural light available but this increases the burden on AC units. So all AC rooms should be well insulated. The glasses of Windows and doors should be double glazed.
2. The gas pressure in AC is decreases due to leakages and then the proper cooling is not obtained hence the gas pressure should be checked at the start of summer season or yearly.
3. Install energy meters in all the blocks for proper energy monitoring.
4. It is observed that there is lot of variation in electrical energy generated from solar PV power plant installed at roof of various blocks. Proper maintenance such as regular cleaning of solar plates should be done for getting optimum generation.

8. GENERAL SUGGESTIONS, COMMENTS AND OBSERVATIONS

Based on the observations made by the audit team as well as per the discussions held with UNIVERSITY staff, during the course of conducting audit, following suggestions/comments/observations are made to improve the general working conditions/comfort level/ maintenance/hygiene level at UNIVERSITY. These have been grouped section-wise wherever possible and rests have been grouped under Miscellaneous Points. UNIVERSITY management is advised to take a note of these for implementation to the extent possible:

8.1 Electrical Load Management:

1. Whenever any new/additional electrical load is to be added in the system, it should be checked whether the existing cable and switch gears can take the extra load. Moreover, the present load on all the three phases should be checked and additional load should be added on the phase least loaded.

8.2 Lighting:

1. A proper cleaning schedule should be maintained for the cleaning of light fittings to maintain the lux levels.
2. Solar switches should be installed for outside lighting instead of manual switching during day/night.

8.3 UPS:

1. In case, new UPS is purchased at any point of time then UPS with high efficiency and least harmonics distortions should be bought. Normally, a good UPS has built-in harmonic filters so as to give minimum THD.
2. Over loading of UPS can be there at UNIVERSITY and this should be avoided at all costs. This at times it leads to by- pass of UPS, which is very risky. In order to avoid overloading of UPS, a regular check up of the entire load on UPS needs to be done.

8.4 Miscellaneous Points

1. Whenever new Tubular Florescent Lights, refrigerators, window/split air conditioners/water coolers, electric motors etc are to be purchased; then, only energy efficient appliances should be bought which have been given highest star (5 star) rating by the BEE to save energy.

2. At the start of summer season the filters and gas pressure in AC should be checked and correct.
3. Massages are displayed at various locations to Aware the Peoples about Energy Savings.
4. Use of Natural Lights and Natural Ventilation should be promoted.
5. The university should frame a Energy policy with consultation of higher management. This policy

By adopting above measures 1% of 5, 00,000 units (5000 units per year) saving on electricity can be achieved.

FOR

Prakash Engineers & Consultant.

Mr. Rajeev Jain

(Energy Auditor)

LIST OF INSTRUMENTS USED

Following instruments were used for conducting the Energy Audit: -

S.No.	Instrument	Features
1.	Digital Temperature Hygrometer	Temperature and Humidity
2.	Digital Infrared Pyrometer	Distant temperature measurement using infrared between -50 to 500° C
3.	Digital Anemometer Rotating Wane Type	Air Velocity
4.	Portable Three Phase Load Manager	(HP, KW, Volt, Amps, P.F., KVAH, KVARH, Neutral current, Frequency, Harmonics, AC/DC 3 Phase/4 Wire , Un Balance Load with data logging facility
5.	Digital Industrial Multimeter	Resistance, AC & DC, voltage, ampere etc.
6.	Distance Meter	
7.	Three Phase Power Analyzer.	(HP, KW, Volt, Amps, P.F. KVAH, KVARH, Frequency, AC/DC 1 Phase
8.	Lux meter	Lumens

FOR

Prakash Engineers & Consultant.

Mr. Rajeev Jain

(Energy Auditor)