REPORT

ON

DETAILED ENERGY AUDIT

Conducted at

M/s LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

Krishna District, Mylavaram,
Andhra Pradesh 521230

Conducted by

Energy Auditing Firm

EAST COAST SUSTAINABLE PRIVATE LIMITED

6-80/1, PRIYA GARDENS P.O SIMHACHALAM, VISAKHAPATNAM
ANDHRA PRADESH – 530028
CIN: U74999AP2018PTC108807

www.eastcoast.net.in

December-2019

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I. ACKNOWLEDGEMENT

THE ENERGY AUDIT TEAM appreciates the keen interest shown by the management of **LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING, MYLAYARAM** in getting Energy Audit done for conservation of energy.

THE ENERGY AUDIT TEAM expresses its sincere thanks to the management of **"LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING, MYLAYARAM"** for their trust and entrusting the assignment of Energy Audit of **LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING, MYLAYARAM, Andhra Pradesh.**

THE ENERGY AUDIT TEAM is grateful to Dr. K. Apparao, Principal of college, for his initiative and confidence in **THE ENERGY AUDIT TEAM** in awarding the mandatory energy audit study.

The audit team very thankful to all the executives of the campus and in specific to following,

- Head of Electrical and Electronics Department

The arrangements and support during the energy audit were excellent. We deeply appreciate the interest, enthusiasm, and commitment of **LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING, MYLAYARAM** towards the energy conservation.

For

The Energy Audit Team

II. ENERGY AUDIT TEAM

Name of the Member	Role in the Project
Mr. G Srinivasa Rao	Team Leader - Accredited Energy Auditor
Mr. Azmal Basha	Team Member - Energy Auditor

The report is made as per the Bureau of Energy Efficiency (BEE), Ministry of Power, and Govt. of India format.

III. EXECUTIVE SUMMARY

East Coast sustainable (P). Ltd has been entrusted with carrying out "Detailed Energy Audit" in Head- Office of M/s Lakireddy Bali Reddy College of Engineering, Mylavaram optimize the energy consumption and to identify the energy saving opportunities in the facility. In this connection, East Coast has conducted field measurements at the facility during December 2019 for collection of data and measuring various energy consumption parameters to analyse and find energy saving opportunities.

The major energy inputs for the facility are Electricity, Diesel, and Water. Electricity is used for Package Air Conditioners, Severs, PCs, ACs, Fans, lighting appliances and other loads. Diesel oil is being used in the DG set to generate electricity during power failure. A detailed study was carried out with an objective to identify and prioritize the cost-effective energy conservation recommendations to decrease the energy consumption and energy costs in the facility.

Lakireddy Bali Reddy College of Engineering Installed 410 kW grid-connected small scale (rooftop) solar PV system available for the benefit of campus these systems installed at their campus building rooftops.

Grid-connected solar PV systems feed solar energy directly into the building loads without battery storage. Surplus energy, if any, is exported to the APSPDCL grid and shortfall, if any, is imported from the grid.

IV. LIST OF ENERGY CONSERVATION RECOMMENDATIONS

The following are the energy conservation recommendations identified in the facility.

List of Energy Saving Recommendations

S. No	Name of the recommendation	Savings (kWh/year)	Monetary Savings (Rs./year)	Investment (Rs.)	Payback period (Months)	Remarks
1	Recommended to check with the authorized service person to improve the performance of the AC'S	20000	156600	NA	NA	
2	Retrofit T12& T8tube lights with LED Tube Light	29789	233849	1023000	52	
3	Retrofit Ceiling Fan with BLDC Fans	49952	392123	4683000	140	

V. IMPORTANT INFORMATION

a) Name and Address of the plant **:** M/s Lakireddy Bali Reddy College of Engineering
Krishna District, Mylavaram,
Andhra Pradesh 521230
India

b) Line of Activity **:** Educational Institutional

c) Contact Person and Details **:** Mr. Munigoti Giridhar
Phone: +91- 9492071771
E-mail: munigoti7@gmail.com

d) Period of Audit **:** December-2019

e) Contracted Maximum Demand (CMD) **:** 400 kVA

f) Maximum Recorded Demand (M.D) **:** 334 kVA (May-2019)

g) Minimum Recorded Demand (M.D) **:** 320 kVA (February-2019)

h) Power factor (PF) **:** 1 (Avg.)

i) Energy Consumption & their cost details **:**

Electricity Consumption details for January 2019- November 2019			
Cost of Electricity : Rs. 7.40/Unit			
Demand Charges : Rs. 385/kVA			
S. No	**Particulars**	**Unit**	**Value**
1	Monthly Avg. Consumption of Electricity	kWh/Month	32,068
2	Monthly Avg. Bill of Electricity	Rs./ Month	323,631
3	Yearly Consumption of Electricity	kWh/Year	416,888
4	Yearly Bill of Electricity	Rs./ Year	4,207,212
5	Maximum Electricity Consumption (Oct-2019)	kWh/Month	507,781
6	Minimum Electricity Consumption (Feb-2019)	kWh/Month	218,752

Diesel Oil Consumption & Units Generated for January 2019 - December 2019						
S. No	**Name**	**Capacity (kVA)**	**Period**	**Operating Hours**	**Diesel Consumption (L)**	**Units Generated**
1	DG Set-I	250	January-2019 to December-2019	120	2860	26700
2	DG Set-II	250	January-2019 to December-2019	130		28925
3	DG Set-III	125	January-2019 to December-2019	5		556

Water Consumption Details for January 2019 – December 2019			
S. No	**Particulars**	**Unit**	**Value**
			Water
1	Yearly Water. Consumption	KL/year	162,500
2	Monthly Water. Consumption	KL/Day	16,250
3	Daily Water Consumption	KL/Day	650
2	Monthly Avg. Cost	Rs./ Month	7,600
4	Yearly bill of Water	Rs./ Year	76,000

1 INTRODUCTION

1.1 GENERAL DETAILS

The Lakkireddy Bali Reddy College, Mylavaram is consists of five Blocks. Each Blocks is spread over four flours and various departments. The ground floor consists of Staff room and lab room, electrical room with outdoor transformer, a bank, an Emergency control room, Government Audit room and few offices. There is also another four storied building which house central admin.

1.2 SCOPE OF THE STUDY:

The major energy consuming loads of the facility are

- HVAC (Package AC units, Split AC units, Window AC units)
- Lights and Fans
- Water Pumps and Fire Water pumps
- PCs, Servers (UPS load)

2 DESCRIPTION OF ENERGY SYSTEMS

2.1 ENERGY SYSTEMS DESCRIPTION

The major inputs for the facility are

i. Electricity from APSPDCL,
ii. Diesel oil for DG sets as a backup for power and
iii. Water for domestic use and fire fighting

- Electricity is the major input energy and used for HVAC, Lighting, Pumping and running the office equipment like Servers, Computers, Printers, etc.
- Diesel oil is used in DG sets to generate power in case of power failure.
- Water is being used for drinking, cooking, washrooms, and firefighting.

2.2 ELECTRICAL ENERGY ANALYSIS

The electricity is sourced from APSPDCL. The following are the details of the electrical supply.

- The facility has a Maximum Contract Demand (CMD) of 400 kVA.
- The facility has installed 3 No of Transformer of capacity 2x 400 kVA & 1x 500 kVA.
- The plant has 3 DG sets of 2x 250 kVA & 1x 125 kVA each capacity and is used in the event of power failure.
- Grid supply is available at 11 kV and is stepped down to 415 Volts. The average power factor is maintained at 1 (avg.)
- The annual electricity consumption of plant is 416,888 kWh (Units) from January-2019 to November-2019. The electricity consumption is varied from 15,840 kWh to 49,480 kWh and the average monthly electricity consumption is 32,068 kWh.
- The annual grid electricity bill during January-2019 to November-2019 is Rs.4,207,212 and monthly average grid electricity bill is Rs. 323,631/-
- The recorded maximum demand is varied from 175 kVA in February-2019 to 334 kVA in May-2019. The month-wise power consumption, actual demand, billed units (kWh) and electricity bill is presented in Table below:

Table 2.2.1:Month wise electricity consumption January 2019 – November 2019

Electricity Bill: Lakireddy Bali Reddy College of Engineering									
HT Consumer No: VJA634									
Sl. No.	**Month**	**CMD (kVA)**	**Recorded Demand (kVA)**	**Billed Demand (kVA)**	**Power Factor**	**Electricity Consumption (kWh)**	**Energy Charges (INR.)**	**Demand Charges Normal (Rs.)**	**Net Electricity Bill (Rs.)**
1	Jan-19	400	204	320	1	22,200	64,589	152,000	223,356
2	Feb-19	400	175	320	1	15,840	61,280	152,000	218,752
3	Mar-19	400	182	320	1	20,836	159,395	152,000	246,419
4	Apr-19	400	318	320	1	35,284	187,087	152,000	349,149
5	May-19	400	334	320	1	34,748	185,221	158,650	284,470
6	Jun-19	400	209	320	1	23,340	69,186	152,000	228,939
7	Jul-19	400	309	320	1	29,804	136,812	152,000	296,328
8	Aug-19	400	316	320	1	46,840	319,525	152,000	482,061
9	Sep-19	400	299	320	1	36,620	196,054	152,000	357,210
10	Oct-19	400	296	320	1	49,480	344,739	152,000	507,781
11	Nov-19	400	266	320	1	39,272	208,018	152,000	370,000
Average		400	260.50	337	1	**32,068**	**174124**	**152554**	**323,631**
Total						**416888**	**2263621**	**1983204**	**4,207,212**
Maximum		**400**	**334**	**320**	**1**	**49,480**	**344739**	**158650**	**507,781**
Minimum		**400**	**175**	**320**	**1**	**15,840**	**61280**	**152000**	**218,752**

2.2.1 RECORDED MAXIMUM DEMAND PATTERN

The below is the recorded demand pattern of the facility from January-2019 to November-2019.

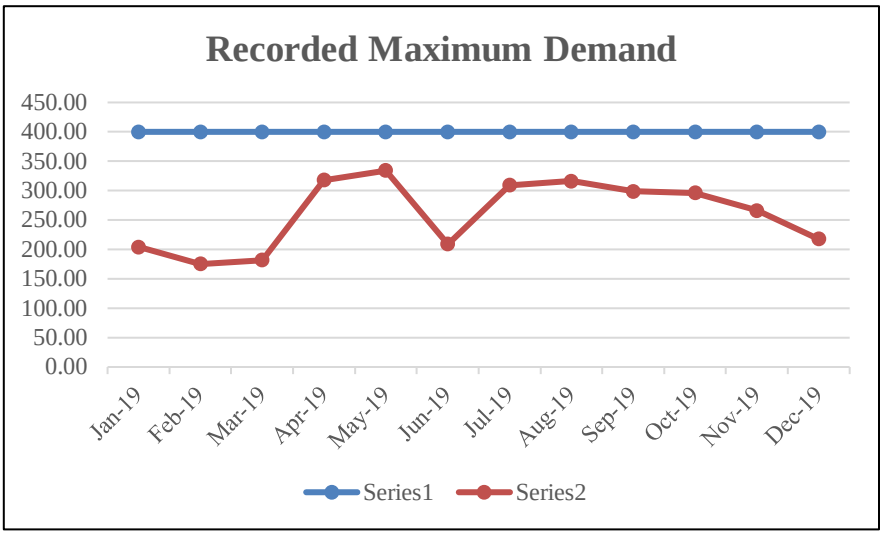

Figure 2.2:1:Recorded Maximum Demand Pattern

2.2.2 ELECTRICITY CONSUMPTION PATTERN

The following is the electricity consumption pattern for the facility from January-2019 to November-2019. The electricity consumption is high during the Oct-2019 and consumption is low in the month of Feb-2019.

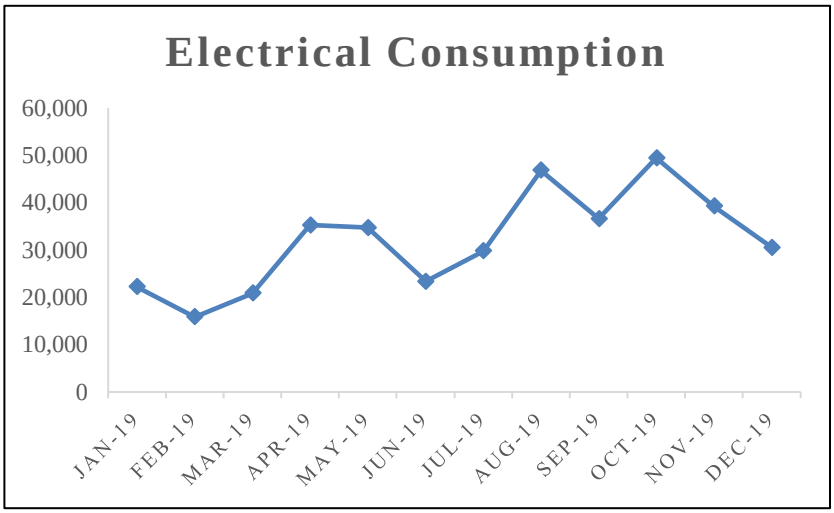

Figure 2.2:2: Month wise electrical consumption pattern

2.3 DIESEL CONSUMPTION ANALYSIS

The facility has two numbers of Diesel Generators of capacity 2x 250kVAeach and 1x 125 kVA. Owing to favourable power supply situation, the DG sets are used very sparingly and accordingly the diesel consumption is insignificant. Most of the diesel consumption is towards idle running of the sets daily for few minutes to upkeep the sets.

2.4 WATER SYSTEM

Municipal Water is sourced from Bore Wells and Mylavaram Municipal Corporations. The consumptive use of water is towards drinking, cooking and for washrooms. The Campus has a sump/tank at ground level where the municipal water is collected after meter. The water from sump is pumped to 6 numbers of over-head tanks located on the main buildings. The water pump also pumps the water to fire water sump to which the fire water pump is connected.

2.5 ENERGY DISTRIBUTION

The distribution of electricity is presented in the following pie-chart.

The % of energy share pattern is as given below:

Table 2.5.1:Energy share pattern

SI. No	Block Name	Power (kW)	% of Energy Share
1	Block -1	204.44	33.99
2	Block -2	104.02	17.30
3	Block -3	97.82	16.26
4	Block -4	82.96	13.79
5	Block -5	87.20	14.50
6	Mechanical Workshop	25.00	4.16
	Total	601.44	100

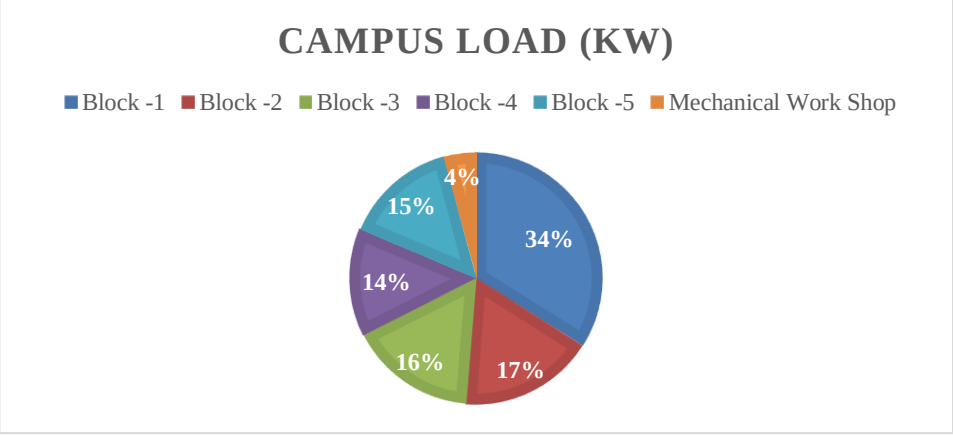

Figure 2.5:1: % of Energy share pattern

2.6 ENERGY DISTRIBUTION OF DIFFERENT BLOCKS

The distribution of electricity is presented in the following pie-chart.

The % of energy share pattern is as given below:

Table 2.6.1:Block-1 Energy share pattern

SI. No	Appliance	Power (KW)	% Sharing of Power (kW)
1	Fans	25	12.2
2	FTLs	12.824	6.3
3	Computers	20	9.8
4	Incandescent lamps	4.26	2.1
5	ACs	140	68.5
6	Projectors	1.14	0.6
7	Others	1.22	0.6
	Total	204.444	100

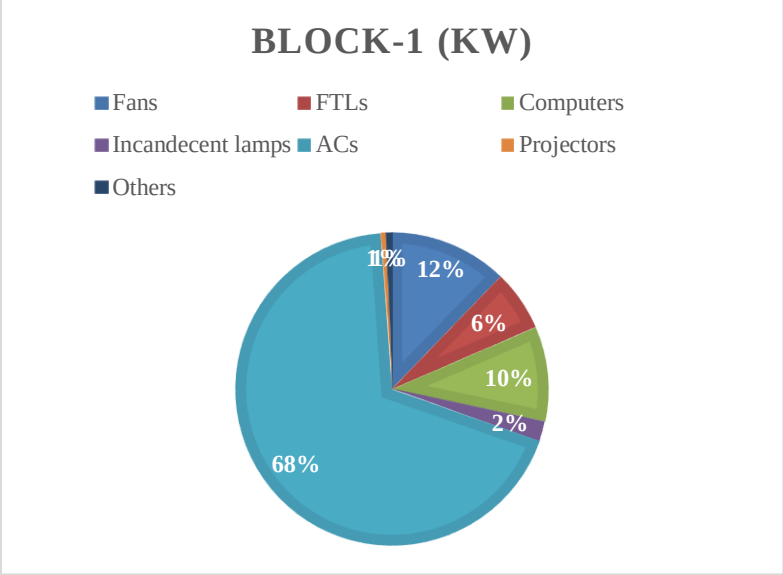

Figure 2.6:1: Block-1 % of Energy share pattern

Table 2.6.2: Block-2 Energy share pattern

SI .No	Appliance	Power (kW)	% Sharing of Power (kW)
1	Fans	13	12.50
2	FTLs	10	9.61
3	Computers	20	19.23
4	Incandescent lamps	3.9	3.75
5	ACs	56.16	53.99
6	Projectors	0.66	0.63
7	Others	0.3	0.29
	Total	104.02	100

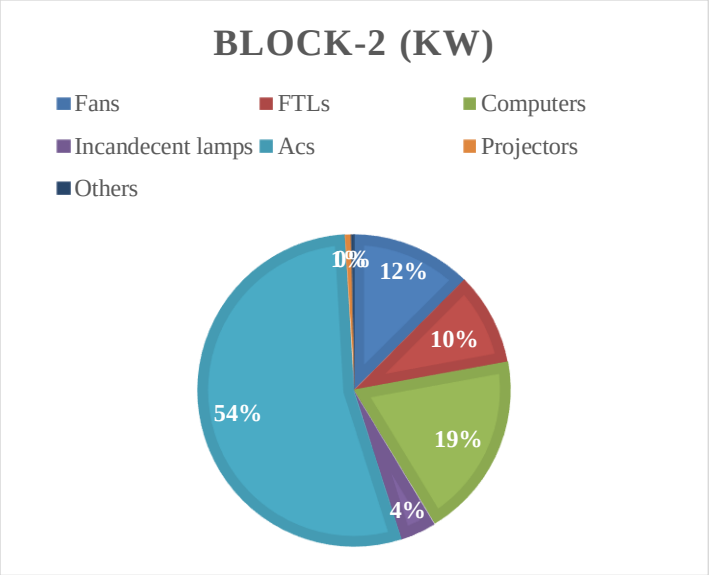

Figure 2.6:2: Block-2 % of Energy share pattern

Table 2.6.2: Block-3 Energy share pattern

SI. No	Appliance	Power (kW)	% Sharing of Power (kW)
1	Fans	15.0	15.3
2	FTLs	10.0	10.2
3	Computers	20.0	20.4
4	Incandescent lamps	3.3	3.4
5	ACs	48.0	49.1
6	Projectors	0.7	0.7
7	Others	0.8	0.8
	Total	97.8	100

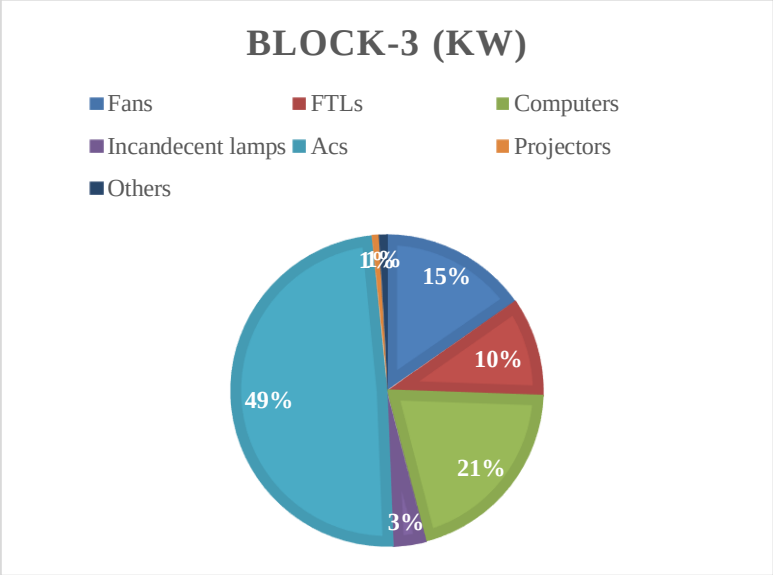

Figure 2.6:3: Block-3 % of Energy share pattern

Table 2.6.4: Block-4 Energy share pattern

SI. No	Appliance	Power (kW)	% Sharing of Power (kW)
1	Fans	23	27.72
2	FTLs	12	14.46
3	Computers	19	22.90
4	Incandescent lamps	0.96	1.16
5	ACs	28	33.75
6	Projectors	0	0.00
7	Others	0	0.00
	Total	82.96	100

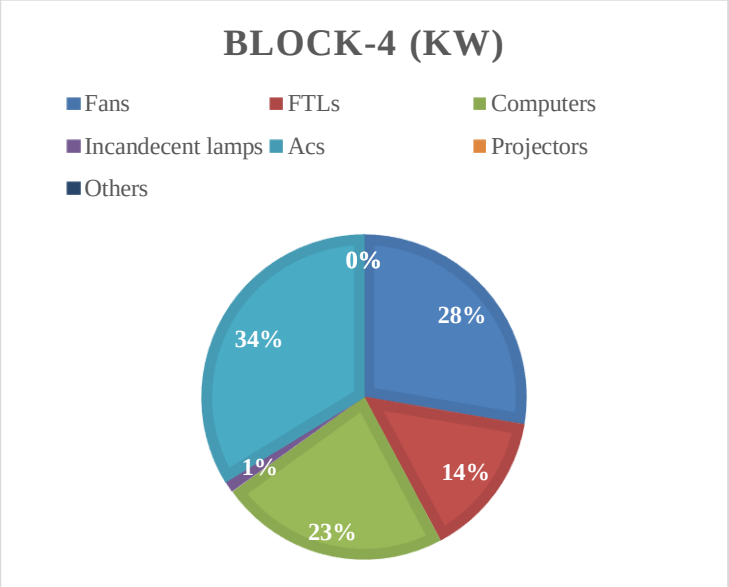

Figure 2.6:4: Block-4 % of Energy share pattern

Table 2.6.5: Block-5 Energy share pattern

SI. No	Appliance	Power (kW)	% Sharing of Power (kW)
1	Fans	25	28.7
2	FTLs	12	13.8
3	Computers	19	21.8
4	Incandescent lamps	3.12	3.6
5	ACs	28.08	32.2
6	Projectors	0	0.0
7	Others	0	0.0
	Total	87.2	100

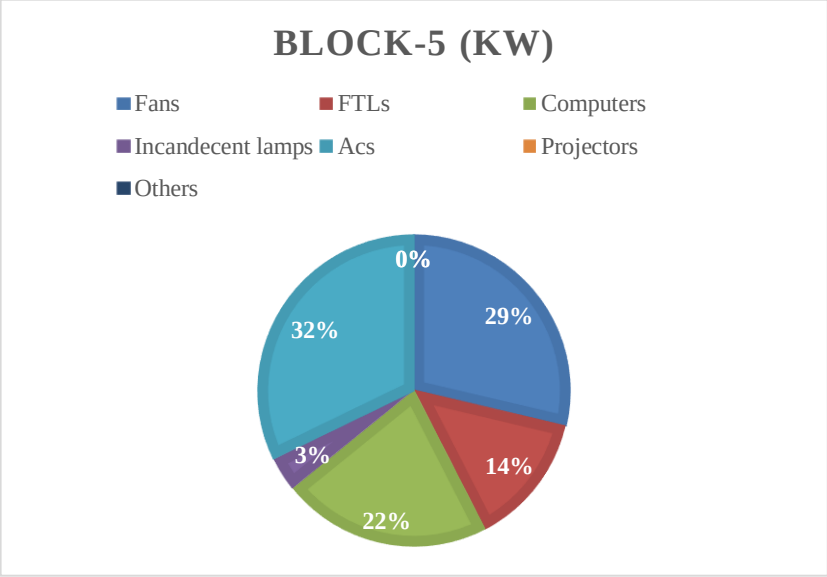

Figure 2.6:5: Block-5 % of Energy share pattern

Table 2.6.6: **Mech Workshop Energy share pattern**

SI. No	Appliance	Power (kW)	% Sharing of Power (kW)
1	Fans	16	64
2	FTLs	9	36
3	Computers	0	0
4	Incandescent lamps	0	0
5	Projectors	0	0
6	Others	0	0
	Total	25	100

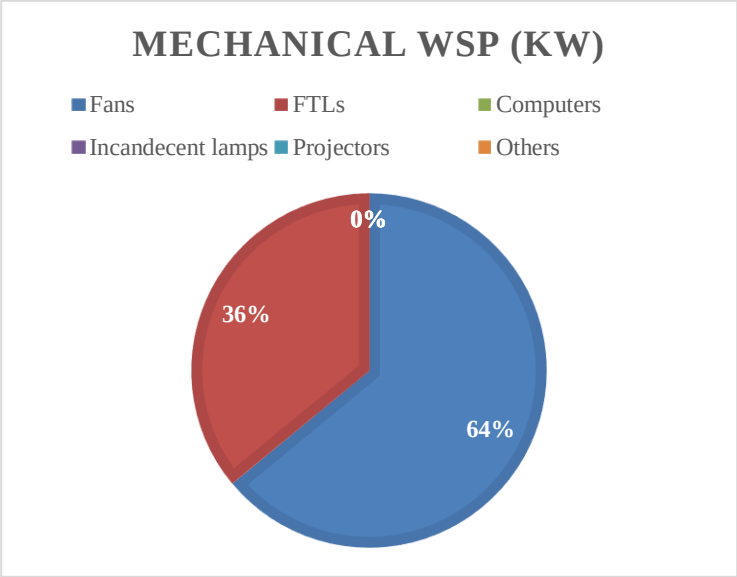

Figure 2.6:6: Mech Workshop % of Energy share pattern

2.7 PUMPS

During the audit it was observed that, 11 pumps are installed in the Campus. 7 pumps are centrifugal, and 4 pumps are Submersible is in operation. The details of the pumps are presented below:

Table 2: Pump systems analysis

Sl. No	Name of the Pump	Capacity of the Pump (HP)	Qty
1	Centrifugal Pumps	3	7
2	Submersible Pumps	5	4

All pumps are running 5 hours per day depending on the usage.

RECOMMENDATION: 1

Description of Existing System and its operation	**:**	**Present power consumption of the AC'S is 300 kW in different Blocks**
Description of Proposed system and its operation	**:**	**It is recommended to check with the authorized service person to improve the performance of the AC'S**
Energy Saving Calculations		
Present power consumption (kW)	:	330
Proposed energy consumption (kW) by servicing	:	50
Achievable Energy savings (kWh/Year)	:	20000
Cost Benefits		
Energy Saving Potential (kWh/Year)	=	20000
Cost Savings (INR)@ INR. 7.83 per kWh	=	156,600
Investment	=	Not considered (Since it is maintenance activity)
Payback Period	=	Immediate

RECOMMENDATION: 2

A: Title of Recommendation	**:**	**Retrofit T12 with LED Tube Light Lamps**
B: Description of Existing System and its operation	**:**	Existing luminaries for Office lighting are T12 Lamps which consumes 36 W
C: Description of Proposed system and its operation	**:**	Retrofit T12 Tube Light's with energy efficient LED Tube Lights to reduce the energy consumption. The LED Tube Lights will consume 22 W without compromising on the illumination levels.
D: Energy Saving Calculations		
Present No. of FTLs		2046
Present Fixture Consumption of T12(W)	**:**	36
Proposed Consumption of LED Tube Light(W)	**:**	22
Achievable power savings(W)	**:**	14
Operating Hours (@ 4 hrs./day & 260 D/Y)	**:**	1040
Total Energy Savings kWh/year	**:**	29,789
E: Cost Benefits		
Energy Saving Potential / year	**=**	29,789
Cost Savings / year@ unit cost Rs. 7.85/ unit	**=**	233,849
Investment (@ Rs. 500/LED)	=	1,023,000
Payback Period in months	**=**	52

RECOMMENDATION: 3

A: Title of Recommendation	**:**	**Retrofit Ceiling Fan with BLDC Fans**
B: Description of Existing System and its operation	**:**	Existing luminaries for Office are Ceiling Fans which consumes 80 W
C: Description of Proposed system and its operation	**:**	Retrofit Ceiling Fan with energy efficient BLDC fan to reduce the energy consumption. The BLDC Fan will consume 40 W.
D: Energy Saving Calculations		
Present No. of Ceiling Fans		1561
Present Ceiling Fan Consumption W	**:**	80
Proposed Consumption of BLDC Fan	**:**	40
Achievable power savings(W)	**:**	40
Operating Hours (@ 4 hrs./day & 200 D/Y)	**:**	800
Total Energy Savings kWh/year	**:**	49,952,000
E: Cost Benefits		
Energy Saving Potential / year	=	49,952
Cost Savings / year@ unit cost Rs. 7.85/ unit	=	392123
Investment (@ Rs. 3000/Fan)	=	4683000
Payback Period in months	=	140

VENDOR INFORMATION

1. Lighting

BIGAPPLE LIFE
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