REPORT

ON

ENERGY AUDIT STUDY

MLRIT

Dundigal, Hyderabad

Submitted By

N Sudhakar Energy Solutions

16-11-16/P/33/55, Malakpet, Hyderabad – 500036

ACKNOWLEDGEMENT

N Sudhakar Energy Solutions, Hyderabad wishes to place on record its deep gratitude to the progressive management of MLRIT for vesting its confidence in N Sudhakar Energy Solutions to carry out **Detailed Energy Audit Study of MLRIT campus**

The study team is specially thankful and appreciative of the keen interest and commitment of **MLRIT** towards the energy efficiency.

SRINIVASA RAO KOPPULA

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Date: 2023.12.05 09:35:09 +05'30'

We are thankful to the respected Principal sir and all the other executives and staff for the assistance during the entire period of the Audit at MLRIT.

N Sudhakar Energy Solutions Team

STUDY TEAM

Mr N Sudhakar, Director
Mr Prithvi, Certified Energy Auditor (EA-31393)

SUMMARY OF SAVINGS

Sl.No.	Suggested Measure	Annual Savings Rs. Lakhs	Investment Rs. Lakhs	Simple Pay back Years	Assumptions
1	Replacement of conventional lights with LEDs	1.30	3.08	2.36	
2	Optimize energy consumption of AC systems by installing Energy saver	3.50	7.21	2.05	
3	Installation of Brushless DC Motor Ceiling Fans	4.67	18	3.85	Operating hours: 2080 Electricity cost: Rs. 7.8/kWh

KEY OBSERVATIONS

Sl.No.	Observation
1	Installation of Energy Efficient Motors
2	Optimization of UPS loading
3	Utlization of sunlight in the daytime
4	Solar Mill

1. INTRODUCTION

1. Brief Overview of the facility

MLR Institute of technologyis established in the year 2005 offers Under graduate, post graduate courses. The campus is well versed with the energy efficiency and renewable energy and conducts energy audits periodically to stay up to date. The campus has already implemented excellent initiatives like setting up solar pv plant, installation of LED lights, usage of star performance computers etc. to name few. However, the management wanted to conduct a third party energy audit assessment as well to identify some other energy saving opportunities.

1.1 Scope of work

The scope of work for the Energy audit study of MLRIT, is as follows;

a. Historical data collection, measurements & analysis
b. Identification of energy saving opportunities
c. Preparation of energy audit report

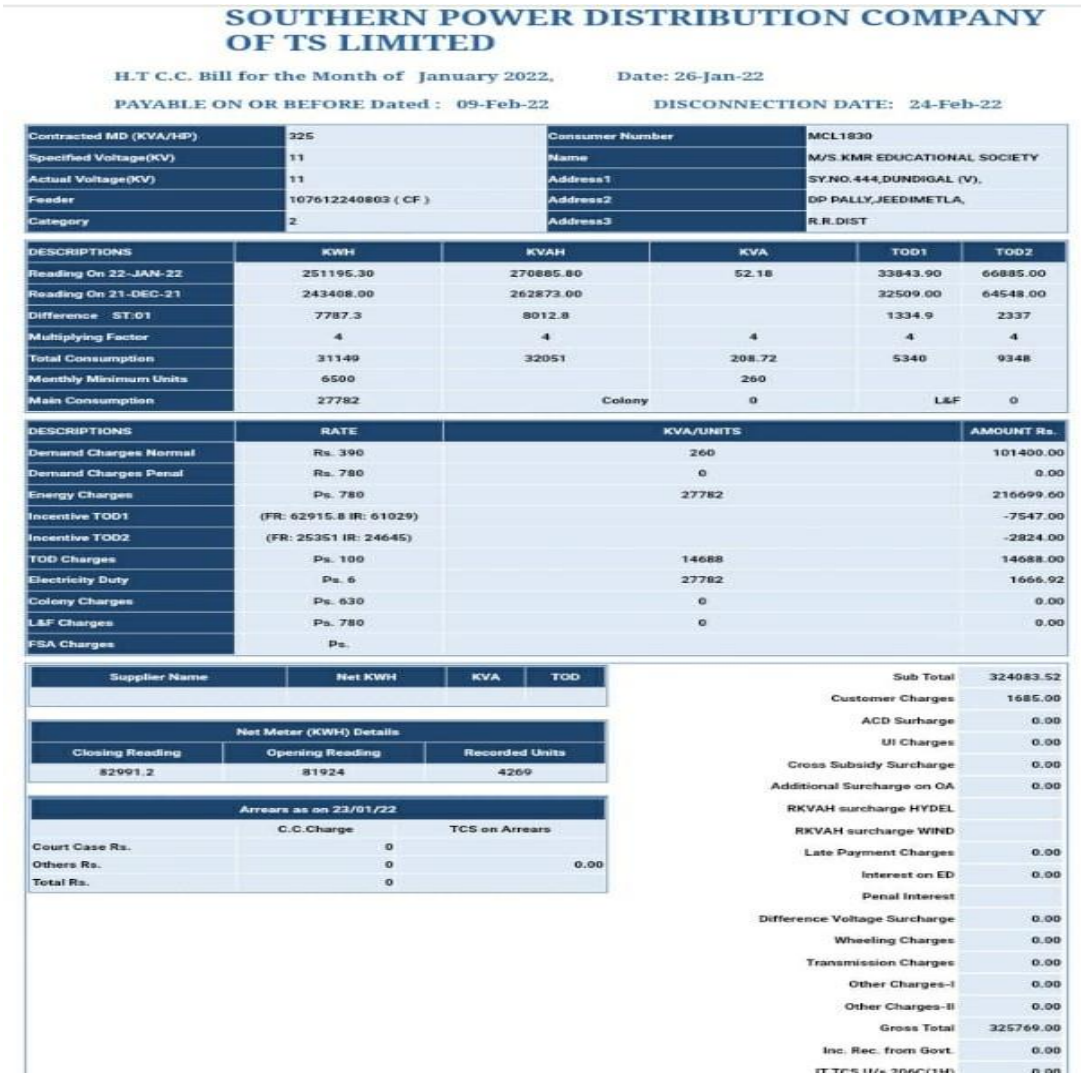
1.2 Instruments Used

Apart from Onsite instruments, portable instruments used in the study include:

a) Power Analyzer

College energy consumption:

The solar plant established in the plant generates on average more than 28,000 units during the summer months and more than 20,000 units during the non-summer months. The sample energy bill is presented below for reference



SOUTHERN POWER DISTRIBUTION COMPANY OF TS LIMITED

H.T C.C. Bill for the Month of January 2022, Date: 26-Jan-22

PAYABLE ON OR BEFORE Dated : 09-Feb-22 DISCONNECTION DATE: 24-Feb-22

Contracted MD (KVA/HP)	325	Consumer Number	MCL1830
Specified Voltage(KV)	11	Name	M/S.KMR EDUCATIONAL SOCIETY
Actual Voltage(KV)	11	Address1	SY.NO.444,DUNDIGAL (V),
Feeder	107612240803 (CF)	Address2	DP PALLY,JEEDIMETLA,
Category	2	Address3	R.R.DIST

DESCRIPTIONS	KWH	KVAH	KVA	TOD1	TOD2
Reading On 22-JAN-22	251195.30	270885.80	52.18	33843.90	66885.00
Reading On 21-DEC-21	243408.00	262873.00		32509.00	64548.00
Difference ST:01	7787.3	8012.8		1334.9	2337
Multiplying Factor	4	4	4	4	4
Total Consumption	31149	32051	208.72	5340	9348
Monthly Minimum Units	6500		260		
Main Consumption	27782	Colony	0	L&F	0

DESCRIPTIONS	RATE	KVA/UNITS	AMOUNT Rs.
Demand Charges Normal	Rs. 390	260	101400.00
Demand Charges Penal	Rs. 780	0	0.00
Energy Charges	Ps. 780	27782	216699.60
Incentive TOD1	(FR: 62915.8 IR: 61029)		-7547.00
Incentive TOD2	(FR: 25351 IR: 24645)		-2824.00
TOD Charges	Ps. 100	14688	14688.00
Electricity Duty	Ps. 6	27782	1666.92
Colony Charges	Ps. 630	0	0.00
L&F Charges	Ps. 780	0	0.00
FSA Charges	Ps.		

Supplier Name	Net KWH	KVA	TOD

Net Meter (KWH) Details		
Closing Reading	Opening Reading	Recorded Units
82991.2	81924	4269

Arrears as on 23/01/22		
	C.C.Charge	TCS on Arrears
Court Case Rs.	0	
Others Rs.	0	0.00
Total Rs.	0	

Sub Total	324083.52
Customer Charges	1685.00
ACD Surharge	0.00
UI Charges	0.00
Cross Subsidy Surcharge	0.00
Additional Surcharge on OA	0.00
RKVAH surcharge HYDEL	
RKVAH surcharge WIND	
Late Payment Charges	0.00
Interest on ED	0.00
Penal Interest	
Difference Voltage Surcharge	0.00
Wheeling Charges	0.00
Transmission Charges	0.00
Other Charges-I	0.00
Other Charges-II	0.00
Gross Total	325769.00
Inc. Rec. from Govt.	0.00

2.Performance of Equipments

Background

The campus has various electrical appliances and the list is as below:

S.No.	Type	Quantity	Wattage	Total energy consumption
1	Tube lights	577	20W	11.5 kW
2	CFL lights	452	15W	6. 7 kW
3	LED lights	1195	20W	23.9 kW
4	Ceiling fans	720	70W	50.4 KW
5	Air Conditioners	103	1.4 kW	144.2 kW
6	6 kVA UPS	6	-	-
7	10 kVA UPS	31	-	-
8	20 kVA UPS	1	-	-
9	Computers	1700	200-300W	400 kW (approx)
10	Motors	4	3.75 kW	15 kW
11	Motors	1	5.5 kW	5.5 kW

Comments:

1. From the above data, it is evident that the main energy guzzlers in the campus are lighting loads, ceiling fans, air conditioning systems, computer systems etc.
2. We identify that energy saving is possible in lighting, ceiling fan, air conditioning systems as low hanging fruits

3. ENERGY CONSERVATION OPTIONS

MLRIT

Encon1. Replacement of conventional lights with LEDs

Background:

The MLRIT campus has more than 1000 conventional lights in the form of CFL lights and fluorescent tube lights. These lights per unit consumes 15W and 20W respectively. There exists a potential for MLRIT to reduce the energy consumption of these lights

Recommendation:

It is recommended to retrofit these lights with LEDs to reduce the energy consumption of these lights. The Cost benefit analysis presented below:

Encon Rationale:

Cost Economics by replacement with LEDs		
Plant	**Units**	**Value**
CFL lights	**Nos**	452
CFL wattage	**W**	15
Total CFL energy consumption	**kW**	6.78
Tube lights	**Nos**	577
Tube lights wattage	**W**	20
Total tube lights energy consumption	**kW**	11.54
Total lights consumption	**kW**	18.3
Electricity Cost	**Rs/kWh**	7.8
LEDs wattage	**W**	10
LEDs energy consumption	**kW**	10.29
kW savings	**kW**	8.03
Cost Savings	**INR Lakhs**	1.08
Investment	**INR Lakhs**	3.08
Payback period	**Years**	2.36

Encon 2. Optimize energy consumption of AC systems by installing Energy saver:

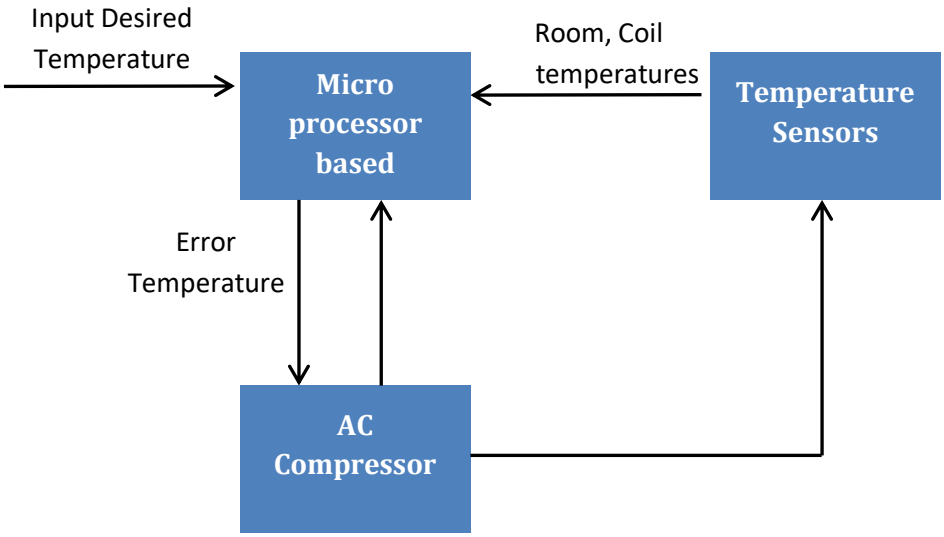
Background:

The campus is equipped with 103 air conditioning systems of 1TR rating system. There exists potential to optimize the energy consumption of these systems by installing the energy saver

Recommendation:

It is recommended to install AC energy savers to optimize the energy consumption of these AC systems. The Air Conditioner Energy Saver acts as an external device connected to the existing Air Conditioning system to optimize the energy consumption. The equipment is a micro processor based device which saves the energy by optimizing the run time of Air Conditioner Compressor system.

Working of AC Energy saver:



- The AC Energy Saver detects the temperature of room, coil through temperature sensors and compares it with the desired input temperature
- The device has a micro processor based controller in place which works in a closed loop circuit with these controls
- It maintains the room temperature and makes sure that no over cooling is achieved by optimizing the run time of compressor
- As long as the compressor of the Air Conditioner system is on stand by mode, the energy consumed by the compressor is reduced which will enable energy savings

- The AC energy saver fits for all kinds of AC's like Inverter, 5 star, Split, Multi Split, Package, Duct, Windows, Cassettes types of air conditioning systems
- The equipment fixes for all the range of AC's ranging from 0.5 TR to 20 TR capacity

The Cost benefit analysis presented below:

Encon Rationale:

Cost Economics by installing AC energy saver		
Plant	**Units**	**Value**
Air conditioning systems	**Nos**	103
AC energy Tonnage	**TR**	1
Per unit AC energy consumption	**kW/TR**	1.4
Total AC energy consumption	**kW**	144.2
Energy savings	**%**	15%
kW Savings	**kW**	21.63
Electricity Cost	**Rs/kWh**	7.8
Cost Savings	**INR Lakhs**	3.50
Investment	**INR Lakhs**	7.21
Payback period	**Years**	2.05

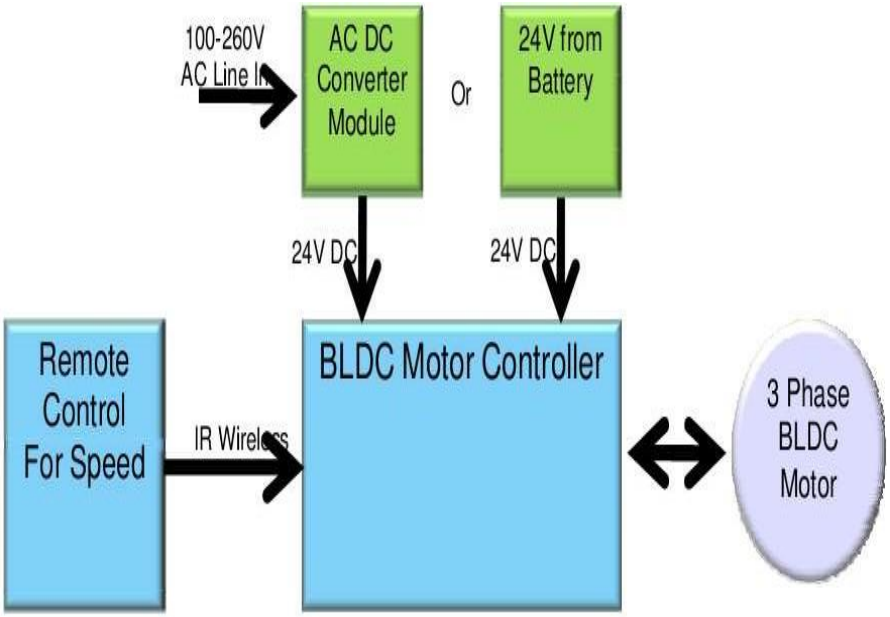
Encon 3. Installation of Brushless DC Motor Ceiling Fans:

Background:

The campus is equipped with 720 ceiling fans which consume around 70W. There exists potential by replacing these fans with Brushless DC (BLDC) Motor Fans to reduce energy consumption

Recommendation:

Instead of conventional ceiling fans, latest technology BLDC fans which consumes only 35W can be installed in the newly constructed building. A brushless DC (BLDC) motor is a synchronous electric Motor powered by direct-current (DC) electricity and having an electronic commutation system, rather than a mechanical commutator and brushes. A BLDC motor has an external armature called the stator, and an internal armature called the rotor. The rotor can usually be a permanent magnet. Typical BLDC motor based ceiling fan has much better efficiency and excellent constant RPM control as it operates out of fixed DC voltage. The proposed BLDC motor and the control electronics operates out of 24V DC through an SMPS having input AC which can vary from 90V to 270V. The operational block diagram of a BLDC motor is as follows:



The Cost benefit analysis presented below:

Encon Rationale:

Cost Economics by installing BLDC Fans		
Plant	**Units**	**Value**
Fans	**Nos**	720
Per unit fans energy consumption	**W**	70
Total fans energy consumption	**kW**	50.4
BLDC Fans consumption per unit	**W**	30
Total BLDC fans energy consumption	**kW**	21.6
kW Savings	**kW**	28.8
Electricity Cost	**Rs/kWh**	7.8
Cost Savings	**INR Lakhs**	4.67
Investment	**INR Lakhs**	18.00
Payback period	**Years**	3.85

4. OBSERVATIONS

Observation 1. Installation of Energy Efficient Motors:

Background:

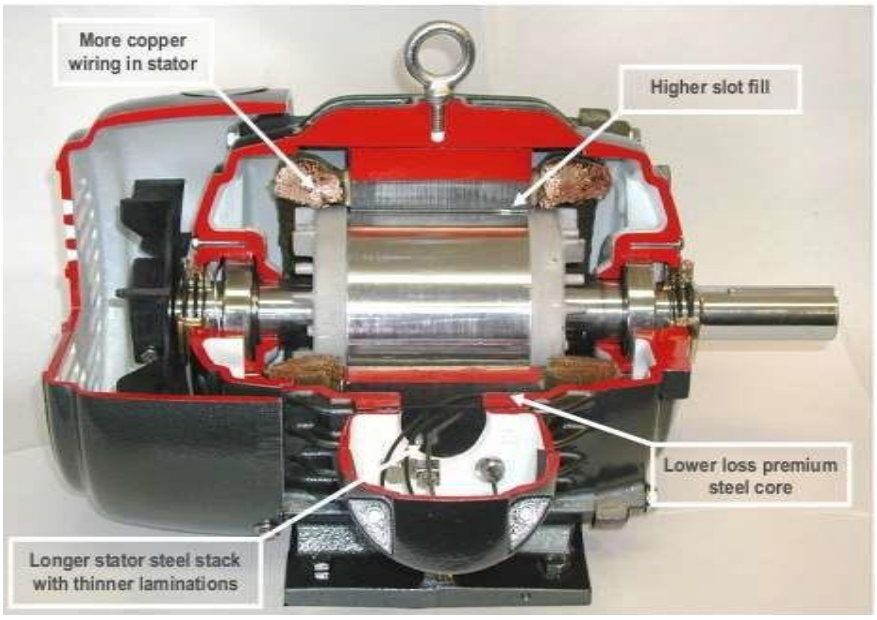
The campus is equipped with four motors of size 5HP and 1 motor of size 7.5 HP. The running hours of these motors are very less to replace them with energy efficient motors as of now. However, in the event of any malfunction of these motors can be replaced with energy efficiency motors in the future

Explanation:

The energy efficient motors are available at efficiencies as high as 96% depending upo the capacities which are relatively prominent with respect to the standard counterparts.

The following betterments in the design of the motors make them Energy Efficient Motors

- Increasing the mass of the rotor conductors to increase the conductivity
- Precision air gaps to reduce current requirements
- Reduction in stator and rotor copper losses
- Improved Lamination design to reduce core losses



Observation 2. Optimization of UPS loading:

Background:

The campus is equipped with many UPS as below

S.No.	Type	Quantity
6	6 kVA UPS	6
7	10 kVA UPS	31
8	20 kVA UPS	1

Explanation:

The UPS is operated with best efficiency under following conditions:

- Bypass / Economical mode: Many inverters have bypass / Eco mode which bypasses the rectifier – inverter circuit of the UPS and allows the grid power to directly feed to the connected load. In the event of power failure, the UPS comes in line and supports the load but there could be a small transient disturbance. This mode of operation can be thought off under the events of no critical equipment on power line or ensured power quality etc.
- High Load Factor: The efficiency of the UPS depends mainly on the loading percentage of the UPS. Often the UPS suppliers claim the efficiency of UPS in the range of 90-95% which is the efficiency of the UPS at full load. If the load of the UPS drops below 50-60%, it will have a reduced efficiency by at least 10% of the full load efficiency. The losses in the UPS increases as the loading factor of the UPS decreases indicating an inverse relation between them. Hence, understanding the efficiency at different loads, which can be obtained from the technical documents of the UPS can help operate the UPS in most efficient manner

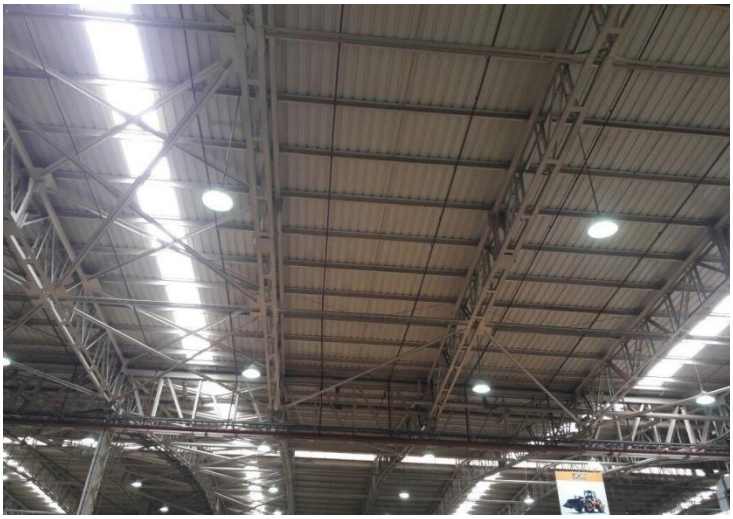
Observation 3. Utlization of sunlight in the daytime:

Background:

All the warehouses, workshops can install translucent sheets / light pipes to eliminate the usage of artificial lights for lighting purposes.

Explanation:

The view of workshops in various factories is given in the below figures for reference



Observation 4. Solarmill:

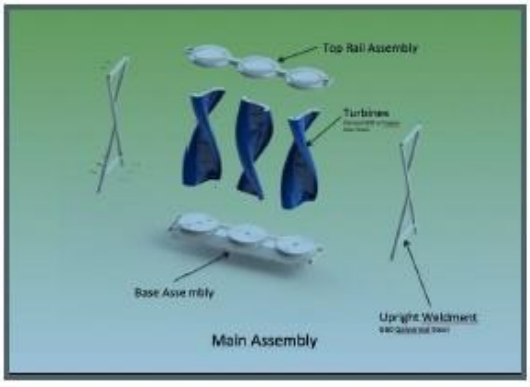
Background:

The management has already installed solar pv cells in the campus which is an excellent initiative towards energy management. The campus can also look in to the retrofit of solar panels to solar mill which can further increase the generation potential

Explanation:

The Solar Mill is another recent development which can generate power utilizing solar and or wind energy.
The SolarMill incorporates 3 vertical axis wind turbines (VAWT) with PV technology within a compact footprint, creating the greatest energy density of any product on the market.
The hybrid concept of the SolarMill is a unique, seamlessly integrating wind and solar energy generation in a single unit. This allows the product to be an effective solution in markets where the natural resources available for wind or solar energy generation alone do not justify investment.
SolarMill have been installed in India, helping businesses achieve mandated carbon emissions reductions.

- Vertical Axis Turbines mounted on a single base
- Cut-in wind speed – 2 m/s & Cut-out wind speed – 18 m/s.
- Turbines (Savonius) produce energy by accepting winds coming from any direction.
- Designed for both On-Grid and Off-Grid applications



Annexure - 1

Vendor's List

1. **Lighting:**

   Philips
   Global presence
   Ph : 000 800 050 7777
   Email: Company contact form

2. **BLDC Fan**

   Atomberg
   Begumpet, Hyderabad
   Phone (WhatsApp): 809-745-4422
   Email: contact@atomberg.com

3. **AC Energy Saver:**

   Magnatron
   Kolkata (Pan India sales & service)
   Phone: 97487 27966
   Email: sales@magnatron.in

For contact of any other suppliers leading to energy efficiency, renewable energy please contact us.

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