GREEN AUDIT REPORT

of

Astha School of Management

Atala, Bhubaneswar, Odisha - 752101

November 2022

Conducted & Prepared by:-

KRISHNA ENGINEERS & CONSULTANTS
4723, Laxmi Vihar, Sainik School Area, Bhubaneswar-751005
Email: krishnaenergy2@gmail.com www.krishnaenergy.com

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PREFACE

Energy audit and Green audit is a study of a facility 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 exist provide the most hopeful prospects for the future.

This Green and Energy audit of Astha School of Management carried out by M/s. Krishna Engineers & Consultants, Bhubaneswar as a part of the work for the mile marker towards destination of achieving energy efficiency of ASM, Bhubaneswar.

Krishna Engineers & Consultants, Bhubaneswar, has compiled a list of possible actions for electrical energy conservation and efficiently utilize the resources and identified their savings potential. Krishna Engineers & Consultants, Bhubaneswar, looks forward with optimism that the management staff of ASM, Bhubaneswar shall ensure the maximum execution of the recommendations and the success of this work.

The contents of this report are recommendatory in nature, based on actual observation & studies made and on the data made available to us in the course of our visits to the unit.

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ACKNOWLEDGEMENT

Krishna Engineers & Consultants is pleased to express its sincere gratitude to the management of Astha School of Management for entrusting us with the assignment on Green Audit practices based on Educate, Practice, Advocate & Manage the resources in their educational facility.

We appreciate and thank the sincere efforts and coordination by Dr. Bankim Mohanty, Executive Director-cum-Secretary, and Prof (Dr) Sharmila Subramanyum, Principal.

We also wish to thank the officials and the maintenance staff for the help rendered during the green audit and energy study. Audit Co-ordinator Mr.Hruda Nanda Pradhan, Computer Lab in charge Mr. Sanjib Kumar Mishra, Librarian Mrs Jharana Rout, Kitchen in charge Mr Jitendra Kuanor and the Students who against all odds have kept the college premises clean to the possible limits. Without the crucial and significant support from the fellow teaching team the energy savings and carbon footprint reduction would not be a reality.

With the motivational support of the management, ground realistic support from teaching team and sincere efforts of the students in incorporating the change (habits) and instructions, the college could effectively declare the reduction in Carbon footprint and optimize the waste reductions.

Wishing the team, a great success we deeply express our gratitude and heartfelt “THANKYOU” for allowing us to assess the energy and green scenario.

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ABOUT THE CONSULTANT

Krishna Engineers & Consultants (KEC) is an ISO 9001: 2015 certified Energy Service Company (ESCO) and professionally managed by technocrats of different disciplines, accredited by Bureau of Energy Efficiency (BEE), Govt. of India, Ministry of Power, New Delhi as Energy Service Company (ESCO) and approved consultant / energy audit firm in Government of Odisha. KEC is also rated as Grade-3 Energy Service Company by CARE Ratings, ICRA, CRISIL which indicates good and satisfactory services for energy efficiency and renewable energy projects. KEC is also empanelled as Technical Consultant/ ESCO for "Implementation of 4E (End to End Energy Efficiency) Solutions in Micro, Small, & Medium Enterprises (MSME) Units" with ISTSL / SIDBI and different Banks.

KEC is a proficient company providing engineering & consultancy services on Energy Conservation and Renewable Energy Projects, since 1995.

Objectives

- To propagate among the public the energy related knowledge systems.
- To equip people to assess the activities and projects of any agency related to energy.
- To co-ordinate the present energy studies, activities and analyse the energy relations of development.
- To conduct Energy audit , power quality audit, Electrical safety audit, water audit, Green Audit in the organisation
- To conduct energy audit, power quality audit, electrical safety audit, water audit,Green Audit in the organization.
- To suggest to implement energy saving equipment for Lights, Fans, AC, Pump, Compressor, Motor etc.
- To conduct training program on energy audit, energy efficiency and renewable energy

Activities:

- Rendering Energy Audit, Power Quality Audit, Electrical Safety Audit, Water Audit and turnkey Consultancy Services on Energy Efficiency & Renewable Energy Solutions for Industries, Institutions, Offices, and Commercial Units.
- Preparing Detailed Project Report (DPR), Pre-Feasibility Report, Biomass Assessment Report, Environmental Impact Assessment Report, and Electrical Safety Audit Report etc.
- Implementing energy efficiency and renewable energy projects like biogas,biomass, Solar, wind, hydro etc. on turnkey basis.

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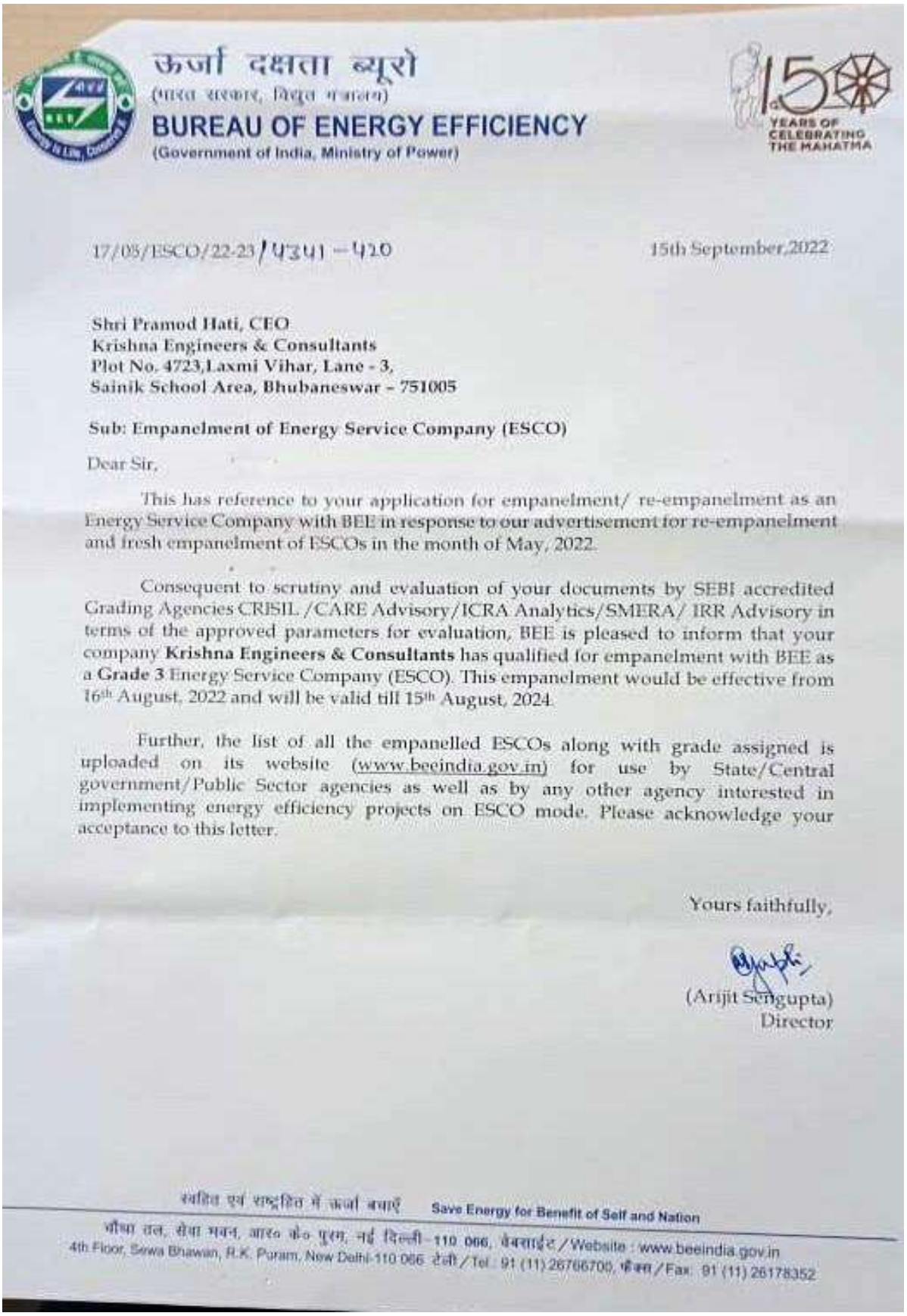

ऊर्जा दक्षता ब्यूरो
(भारत सरकार, विद्युत मंत्रालय)
BUREAU OF ENERGY EFFICIENCY
(Government of India, Ministry of Power)

15 YEARS OF CELEBRATING THE MAHATMA

17/05/ESCO/22-23/4341 – 420 15th September,2022

Shri Pramod Hati, CEO
Krishna Engineers & Consultants
Plot No. 4723,Laxmi Vihar, Lane - 3,
Sainik School Area, Bhubaneswar – 751005

Sub: Empanelment of Energy Service Company (ESCO)

Dear Sir,

This has reference to your application for empanelment/ re-empanelment as an Energy Service Company with BEE in response to our advertisement for re-empanelment and fresh empanelment of ESCOs in the month of May, 2022.

Consequent to scrutiny and evaluation of your documents by SEBI accredited Grading Agencies CRISIL /CARE Advisory/ICRA Analytics/SMERA/ IRR Advisory in terms of the approved parameters for evaluation, BEE is pleased to inform that your company **Krishna Engineers & Consultants** has qualified for empanelment with BEE as a **Grade 3** Energy Service Company (ESCO). This empanelment would be effective from 16th August, 2022 and will be valid till 15th August, 2024.

Further, the list of all the empanelled ESCOs along with grade assigned is uploaded on its website (www.beeindia.gov.in) for use by State/Central government/Public Sector agencies as well as by any other agency interested in implementing energy efficiency projects on ESCO mode. Please acknowledge your acceptance to this letter.

Yours faithfully,

(Arijit Sengupta)
Director

स्वहित एवं राष्ट्रहित में ऊर्जा बचाएँ Save Energy for Benefit of Self and Nation

चौथा तल, सेवा भवन, आर० के० पुरम, नई दिल्ली-110 066, वेबसाईट/Website : www.beeindia.gov.in
4th Floor, Sewa Bhawan, R.K. Puram, New Delhi-110 066 टेली/Tel : 91 (11) 26766700, फैक्स/Fax : 91 (11) 26178352

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ଓଡ଼ିଶା ସରକାର

GOVERNMENT OF ODISHA
OFFICE OF THE ENGINEER-IN-CHIEF, ELECTRICITY-CUM-
PRINCIPAL CHIEF ELECTRICAL INSPECTOR (ODISHA)
POWER HOUSE SQUARE, UNIT-V, BHUBANESWAR
TEL. NO.0674-2394873, Fax: 2391255/ 2391024,
E-Mail: sdaorissa@nic.in

Notification

No. Tech-EC-851 / 3800 / Dated, Bhubaneswar 03 September 2016.

The following firms are empanelled to carry out Energy Audit in Government Building of Odisha subject to terms & conditions as laid down Overleaf.

1. Power Tech Consultants, Cuttack
2. Petroleum Conservation Research Association(PCRA), Bhubaneswar
3. PGS Energy Services Pvt. Ltd, Chandigarh
4. NIN Energy India Private Limited, Chennai
5. The Energy and Resources Institute(TERI), New Delhi
6. Krishna Engineers and Consultant, Bhubaneswar

Sd/- 2/9/16
EIC (E)-cum-PCEI & SDA (O).

Memo No. 3801 (6) / Dated, Bhubaneswar 03 September 2016.

Copy to:

1. M/s Power Tech Consultants, 1-A/6, Swati Villa, Link road, Cuttack-753012, Odisha.
2. M/s Petroleum Conservation Research Association (PCRA), 1657/4000, Canal Road, BJB Nagar, Bhubaneswar-751014, Odisha.
3. M/s PGS Energy Services Pvt. Ltd, SCO 409-410, Sector 35-C, Chandigarh (H.O), India.
4. M/s NIN Energy India Private Limited, JUSA Complex, New No 47, Old No 21/2, Ponniamman Koli Street, Kottur, Chennai-600085, Tamilnadu, India.
5. M/s The Energy and Resources Institute (TERI), Darbari Seth Block, H C Complex, Lodhi Road, New Delhi-110 003, India.
6. M/s Krishna Engineers and Consultants, Plot No- 4723, Laxmi Vihar, Sainik School, Bhubaneswar-751005, Odisha.

for information and necessary action.

This is with reference to the EOI published on dated 01.03.2016 for empanelment of Energy Auditing Firms/ESCOs to provide consulting services for Investment Grade Energy Audit (IGEA) of various Govt. buildings of Odisha.

The Empanelled Agencies are requested to acknowledge the empanellement by returning a copy of the notification duly signed in the prescribed format given overleaf.

Sd/- 2/9/16
EIC (E)-cum-PCEI & SDA (O).

All

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Krishna Engineers & Consultants
(An ISO 9001:2015 Certified Company)
4723, Laxmi Vihar, Lane-3, Sainik School Area, Bhubaneswar-751005
Phone : 0674-2567684, Mob: +9114160231, 9861778478
Email ID : info@krishnaenergy.com / krishnaenergy2@gmail.com

Certificate

- The Green And Energy Audit Report of Astha School of Management, Atala, Balianta, Bhubaneswar, has been prepared by Experienced Energy Auditors and Consultants of M/s Krishna Engineers & Consultants, Bhubaneswar.
- Review of findings of internal green & environmental audits has been carried out diligently and truthfully on the basis of Desktop review of documents/records, virtual tour of the School campus and telephonic interviews of faculty, non-teaching staff & students.
- All data measuring devices used by the Auditors are in a good working condition and beer calibrated and have valid certificate from the authorized approved agencies and tampering of such devices has not occurred.
- All attempts have been made to evaluate the scope for Development and inculcate green practices in the campus and extended to out of the campus.
- The Green Audit Report also presents green initiatives followed and taken up by the School and provides suggestions and recommendations to improve environmental sustainability.
- The detailed Energy audit has been carried out on accordance with the prescribed norms of Ms Krishna Engineers & Consultants and as per the scope of the work derived by the Astha School of Management, Bhubaneswar

Work Order Ref No. ASM/7060/22, Dated 28/09/2022
Date of Audit :4th October 2022 to 14 th November 2022
Conducted by : Krishna Engineers & Consultants
4723, Laxmi Vihar, Lane-3, Sainik School, Bhubaneswar-751005
Email Id: krishnaenergy2@gmail.com
Web site: www.krishnaenergy.com

M/s Krishna Enginers & Consultants
Bhubaneswar
Date : 14/11/2022

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EXECUTIVE SUMMARY

During the audit it was observed that the ASM, Bhubaneswar has major loads such as Light, Fan, Air Conditioners (ACs), Computers, Pumps and Laboratory Equipments etc. The audit was carried out with an objective to identify the existing electricity consumption by respective equipment, the area of wastage and identify the areas for improvement of the same. This analysis will help to provide necessary recommendations to improve the operations and to prioritize the implementation of cost effective energy conservation measures.

The report highlights the total connected load and electricity consumption of different loads existing in the ASM and suitable recommendations for conservation of energy.

Overall Benefits after Implementation of recommended EE Measures

Sl No.		Unit	Baseline (Before Implementation)	To be (Post-Implementation)	Difference	(% Change)
1	Electrical Energy Used	kWh/Yr	117626	24001	93625	79.60%
2	Diesel Used	KL/Yr	1550	1191	359	23.16%
3	LPG Used	Kg/Yr	1120	827	293	26%
4	Coal Used	Kg/Yr	6000	0	6000	100%
5	Total Energy Cost	Rs./Yr	960871	52787	908084	94.51%
6	Overall Energy Consumption	MTOE/Yr	15.63	2.06	13.66	87.39%
7	Overall CO2 Emission	tCO2/Yr	132.70	25.82	106.88	80.55%

The emission and oil equivalent factors

Fuel	Emission	Oil Equivalent
	Kg Co2	TOE
Electricity	0.95	0.086
Diesel	2.70	0.01
LPG	2.25	1.162
Firewood	1.80	0.3215
Coal	2.375	0.70

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Cost Benefit Analysis - Energy Conservation Measures

Summary of ECM, Investment, Energy Savings and Payback Period											
Sl No	**Description of ECM**	**Estimated Investment**	**Reduction in Demand**	**Estimated Annual Savings**					**Payback Period**	**Reduction of Emission**	**Eq. energy Saving**
		(Rs.)	**KW**	**(kWh)**	**Diesel (ltr)**	**LPG (Kg)**	**Coal (Kg)**	**(Rs.)**	**(months)**	**(t Co2)**	**MTOE**
1	Replacement of old fans with BLDC fan	8,12,000	20.88	33,878				2,76,745	35	32.18	2.91
2	Retrofitting Microcontroller AC Energy Saver	1,99,500		9,833				80,326	30	9.34	0.85
3	Retrofitting PIR Sensor for Lights and Fans	30,000		1,848				15,097	24	1.76	0.16
4	Installation of Energy Management System to Control and Monitor Sub Station, DG Sets, and ACs	1,00,000		1,865				35,237	34	1.77	0.16
5	Installation of Net Metering Solar Power System	16,50,000		46,200				3,77,402	52	43.89	3.97
6	Retrofitting of Fuel Saver in DG Set	50,000			359			34,100	18	0.97	0.0036
7	Installation of Biogas Digester	3,00,000				1,210		1,06,344	34	2.72	1.41
8	Installation of Steam Cooking with Solar Water Heater	4,50,000					6,000	42,417	127	14.25	4.20
	TOTAL	**35,91,500**	**20.88**	**93,625**	**359**	**1,210**	**6,000**	**9,67,667**	**45**	**106.88**	**13.66**

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DETAILS OF ASTHA SCHOOL OF MANAGEMENT
BHUBANESWAR

1	Name and Address	Astha School of Management, 261, Panchamukhi Vihar, Bhubaneswar-752101, Odisha Email: asthaschoolmgm@gmail.com
2	Line of Activity	Educational Institution
3	Name of Contact Person& Contact Details	Prof. (Dr.) Bankim Mohanty, Executive Director cum Secretary 9439917604
4	Period of Audit	Sept' 2021 – Aug' 2022
5	REC Campus/Building	Owned
6	Connected Load	83.04 KW
7	Contract Demand	50 KW
8	Average Maximum Demand	30.67 KVA
9	Average Power factor (PF)	0.99
10	Annual Energy Consumption (kWh)	93261 kWh
11	Annual Energy Consumed through DG Sets	4526 kWh
12	Annual Energy Consumed through Solar Power	19839 kWh
13	Total Annual Energy Consumption	117626 kWh
14	Annual Electricity Cost (Rs)	INR 753621
15	Annual Diesel Cost (Rs)	INR 147250
16	Total Energy Cost (Rs.)	INR 960871
17	Average Cost of Electricity/kWh	INR. 8.17/ kWh

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INTRODUCTION

BACK GROUND OF THE PROPOSAL

Green audit is defined as an official examination of the effects a college has on the environment. As a part of such practice, internal environmental audit (Green Audit) is conducted to evaluate the actual scenario at the campus. The purpose of an environmental audit is to: assess the nature and extent of the risk of harm to human health or the environment. This may be from contaminated land, waste, pollution or any activity. recommend measures to manage the risk of harm to human health or the environment.

This Green audit was carried out by Krishna Engineers & Consultants, Bhubaneswar as part of Energy Efficiency, Clean Energy and Waste Management program of Astha School of Management and assigned Krishna Engineers & Consultants to conduct a green audit at their campus Bhubaneswar.

GENERAL DETAILS AND DESCRIPTIONS

A team of One Energy Auditors, one Electrician and two Senior Executive of Krishna Engineers & Consultants had visited the ASM, Bhubaneswar 05th November to 14th November 2022 for conducting the Green Audit.

ASM is located at Panchamukhi Vihar, Balianta, Bhubaneswar, Odisha which is 9 km to Railway Station, and 3 km to National Highway. School campus consists of four separate rooftop buildings, and those are Academic Section, 3 storied Boys Hostel, 3 storied Girls Hostel and Canteen building. Academic Building is of two storied building of Area of 1696 Sqft comprising Digital Class rooms, Digital Language Lab, Girls Common Room, Principal Chamber, Secretary Chamber, Administrative office, Board Room, Library, Professors' Chamber, Placement Office cum Future-ready Training Room and 14 wash rooms.

Both Boys Hostel and Girls Hostel has constructed separately with 3 story building of total plinth area of 2902 Sqft. The Canteen has covered with 2760 Sqft. Single storied Hall for 150 capacity of Dinning with comfort and hygienic environment. Inside the campus a 2760 Sqft green area

The electrical supply for the units connected from Tata Power Central Odisha Power Distribution Limited (TPCOPDL). The Terrace of Academic building is occupied with 17 KWp Solar panel. There is one DG set of 35 KVA which supply Power to Academic Building at time of emergency. The DG set consumes 1550 litre of diesel on an average per year. Canteen consumes 15 commercial cylinder and d 12 quintal Charcoal for cooking purpose. The connected load in the college is mainly lights, AC, Fans, Pumps, and Computers etc.

Three Over head tank of 8000 litre capacity at Boys Hostel, 7000 capacity at girls hostel and 4000 litre capacity for Academic building and out of which about 15000 litre has consumed for gardening by 2 water pumps.

Green Audit Objective

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus. The purpose of the audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

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METHODOLOGY

The following Green Audit structure is prepared for developing energy efficiency and green campus projects to be implemented. As part of the audit, a team comprising of One Auditor, One Electrician and Two Sr. Executives visited the ASM campus for physical inspection, verifying records & measurement, data collection, monitoring of key parameters, etc.

APPROACH & METHODOLOGY

Krishna Engineers & Consultants has adopted the following methodology:

i. Collection of historical data pertaining to the consumption of electricity, procurement of diesel, coal, fire wood, LPG etc for last one year.
ii. Analyse energy consumption, emission generation, total equivalent of oil consumption and possibility of energy efficiency and Renewable energy.
iii. Collection and analyse of data water drawl, consumption, waste water and treatment of the water.
iv. Collection and analyse of data for waste generation and its management
v. Collection and analyse of data about the plantation in the campus and its benefits.
vi. Discussions with maintenance personnel, key executive, management and students to take note of operating practices and to identify specific problem areas and bottlenecks, if any.
vii. Identification and quantification of energy losses.
viii. Identification of suitable measures which may reduce energy wastages.
ix. Identification of Renewable energy and waste management.
x. Preparations of cost benefit analysis for recommended measures.

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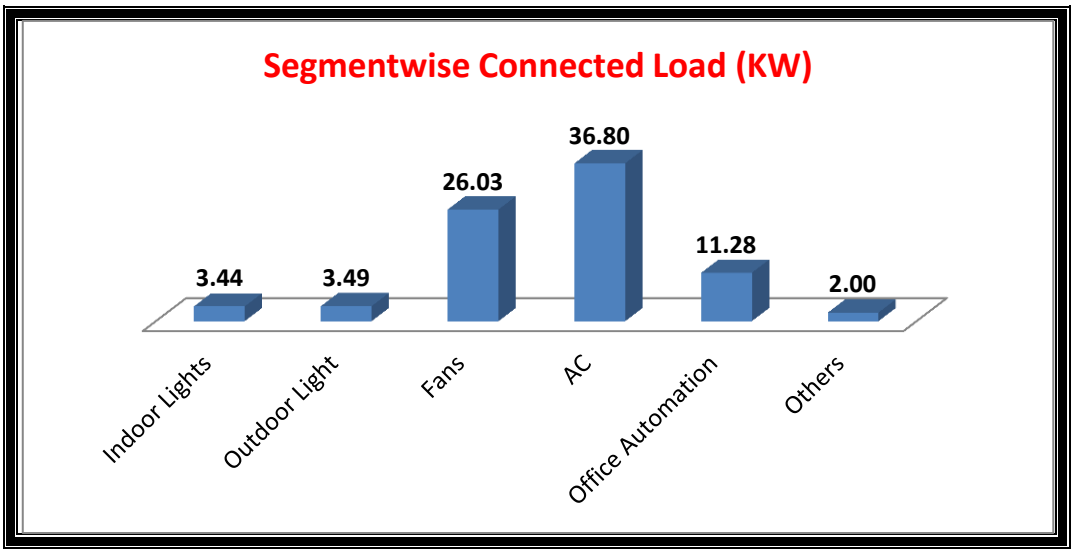
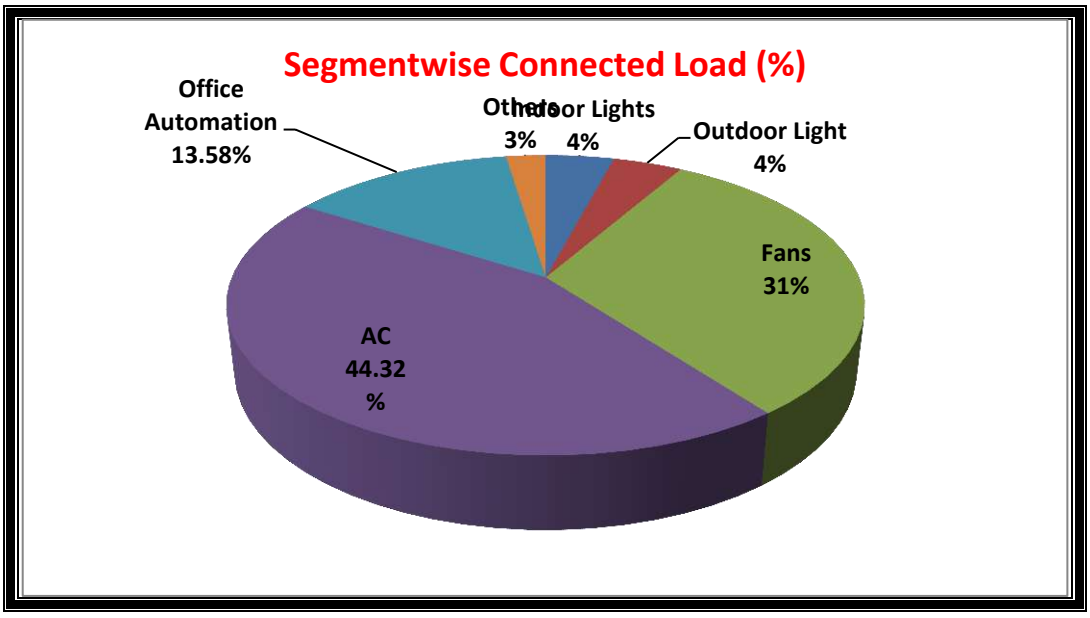
UTILITY ANALYSIS

Segment wise Connected Load

Equipments use	Load (KW)	% of Segmented Loads
Indoor Lights	3.44	4.14%
Outdoor Light	3.49	4.20%
Fans	26.03	31.35%
AC	36.80	44.32%
Office Automation	11.28	13.58%
Others	2.00	2.41%
Total	**83.04**	**100%**





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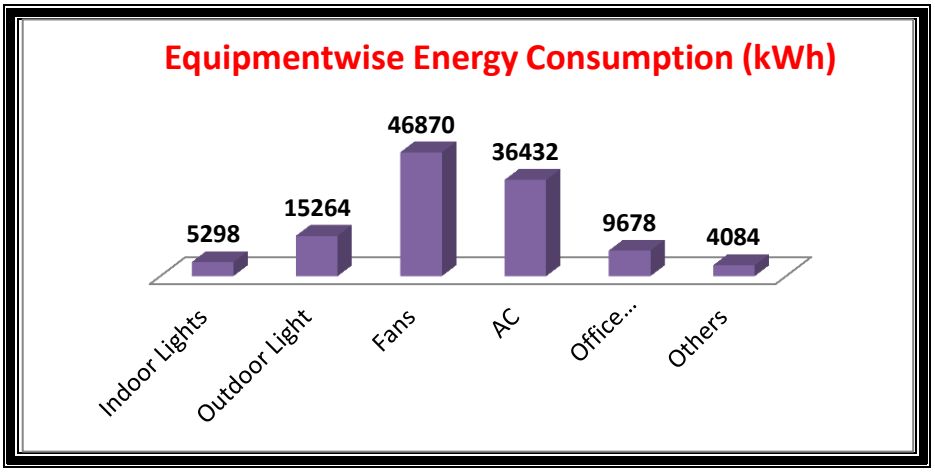
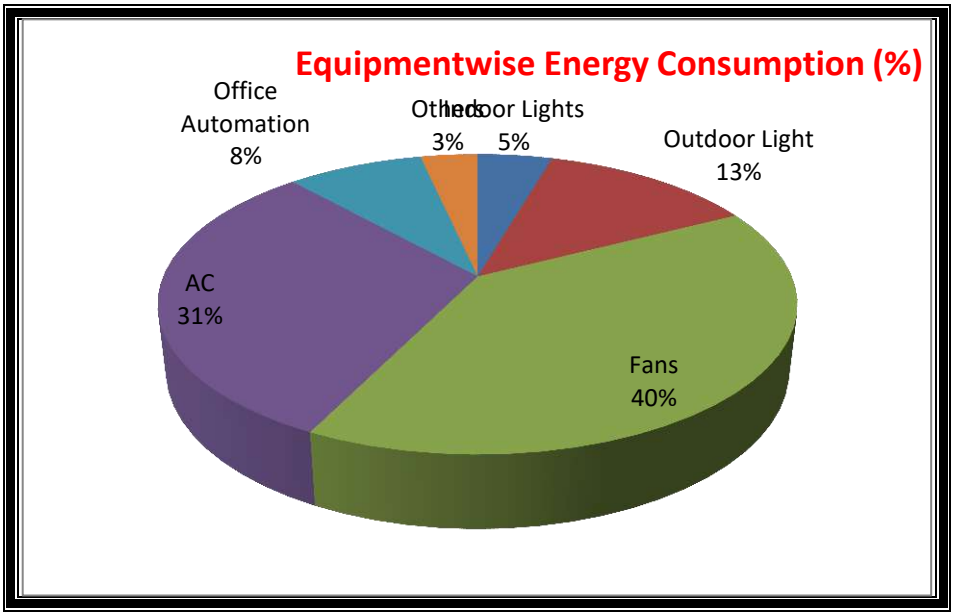
Equipment wise energy consumption

Equipments use	Unit Consumption (kWh)	% of Segment wise Unit Consumption
Indoor Lights	5298	4.50%
Outdoor Light	15264	12.98%
Fans	46870	39.85%
AC	36432	30.97%
Office Automation	9678	8.23%
Others	4084	3.47%
Total	**117626**	**100%**





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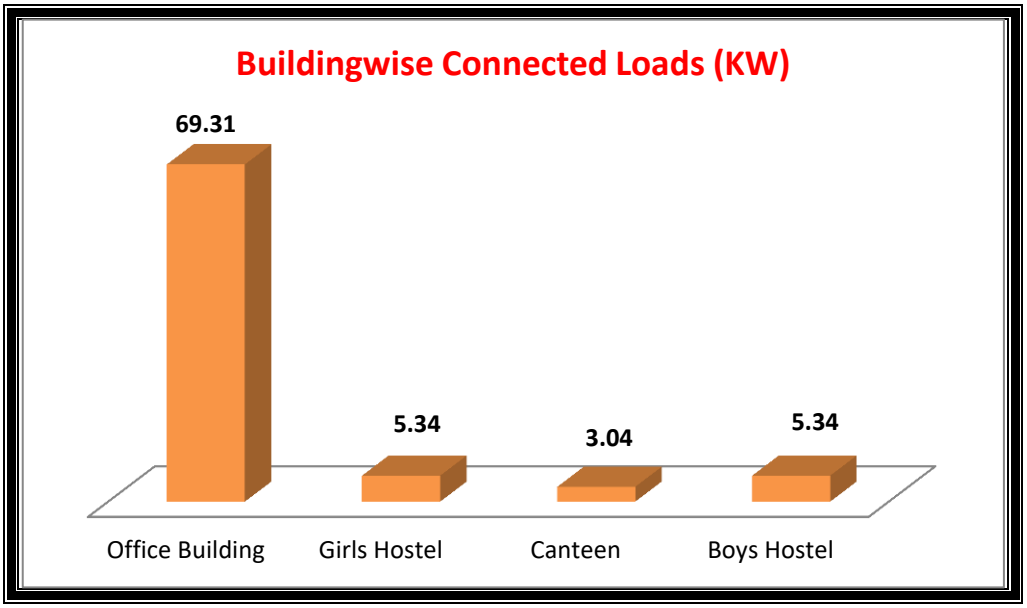
Building wise Connected Load

Name of Building	Connected Loads (KW)	% Segmented Loads
Office Building	69.31	83.46%
Girls Hostel	5.34	6.44%
Canteen	3.04	3.67%
Boys Hostel	5.34	6.44%
Total	**83.04**	**100%**



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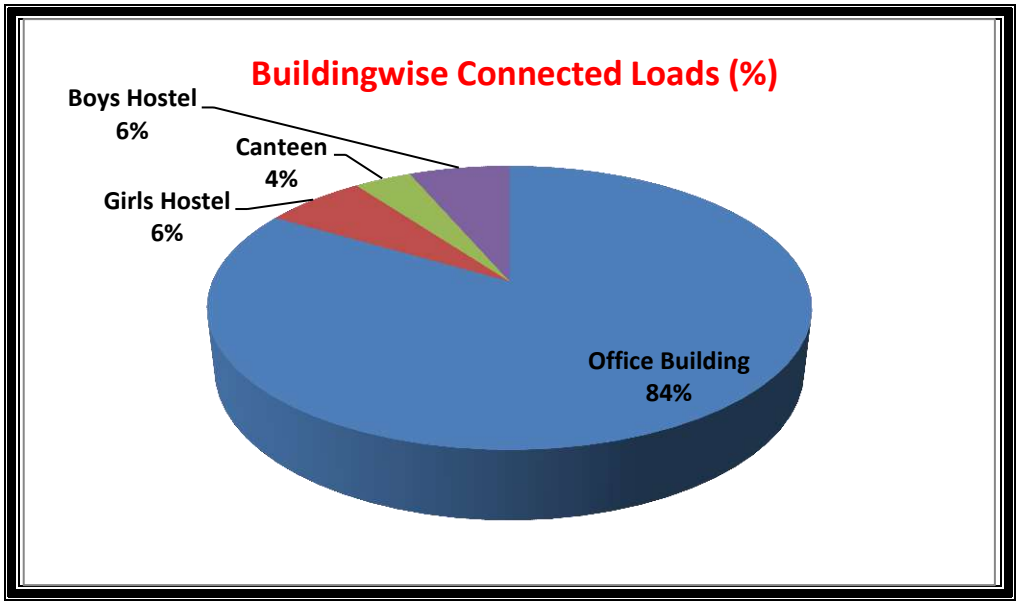
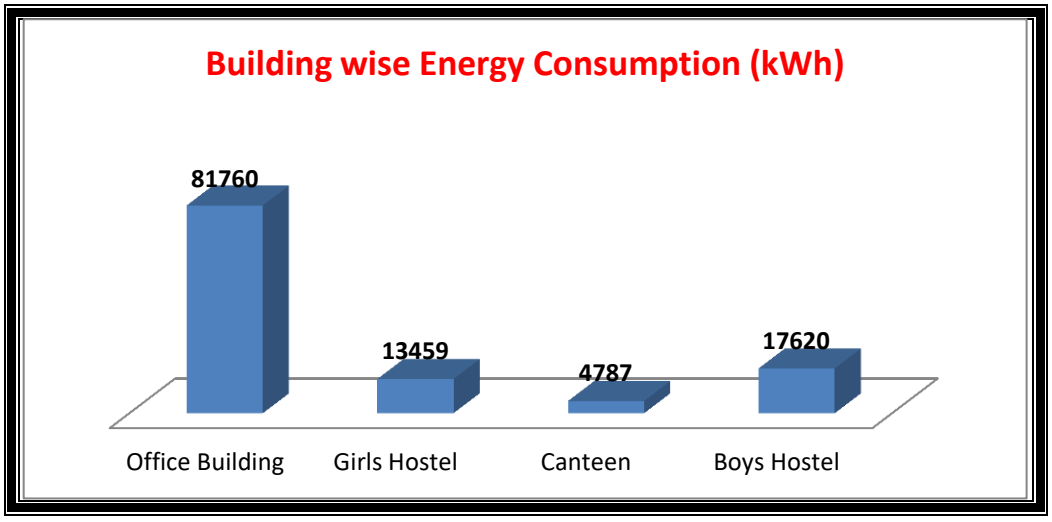


Building wise Energy Consumption

Sl. No	Energy Consumption (kWh)	Name of Building	% Segmented Energy Consumption
1	81760	Office Building	67.28%
2	13459	Girls Hostel	11.05%
3	4787	Canteen	4.24%
4	17620	Boys Hostel	17.43%
	117626	**Total**	**100%**



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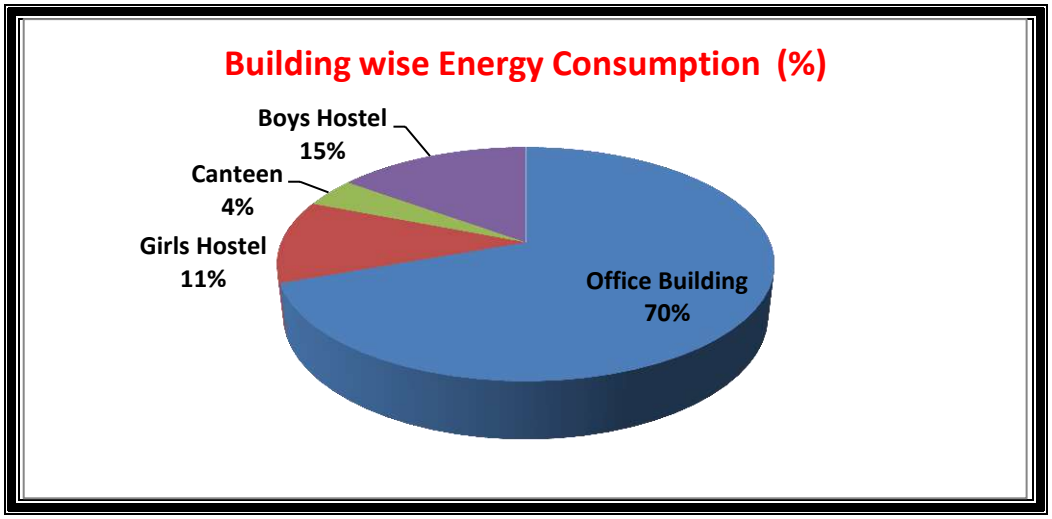

Monthly Electricity Bill Analysis - Transformer 100 KVA

Monthly Electricity Bill Analysis										
Month	Energy Consumption		Max. Demand Recoded	Min. Demand Charged	Demand Charges	Power Factor	Operating Hour	Average Load Factor	Electricity Cost	Electricity Cost
	KWH	KVAH	kVA	kVA	(Rs)	(%)	Hr	(%)	(Rs.)	(Rs/ kWh)
Sep 21	6218	6238	34.28	36.0	1080	99.66%	720	25.28	50925	8.19
Oct 21	5495	5523	27.12	36.0	1080	99.50%	744	27.37	45210	8.23
Nov 21	4607	4646	20.44	36.0	1080	99.16%	729	31.18	38192	8.29
Dec 22	5122	5151	21.96	36.0	1080	99.45%	744	31.52	42262	8.25
Jan 22	3678	3709	13.92	36.0	1080	99.20%	744	35.80	30857	8.39
Feb 22	4788	1812	28.88	36.0	1080	99.51%	672	24.79	39622	8.28
Mar 22	8878	8908	43.84	45.0	1350	99.66%	744	27.31	72190	8.13
Apr 22	8722	8763	43.98	45.0	1350	99.53%	720	27.67	70118	8.04
May 22	8722	8763	43.04	45.0	1350	99.53%	744	27.37	70120	8.04
Jun 22	5996	5994	29.08	45.0	1350	99.38%	720	28.82	48537	8.09
July 22	6813	6848	29.60	45.0	1350	99.49%	744	31.10	55898	8.20
Aug 22	7192	7225	31.96	45.0	1350	99.54%	744	30.39	58175	8.09
Total	**76,231**	**73,580**	**368**	**486.0**	**14,580**	**99.47%**		**29.05%**	**622106**	**8.16**

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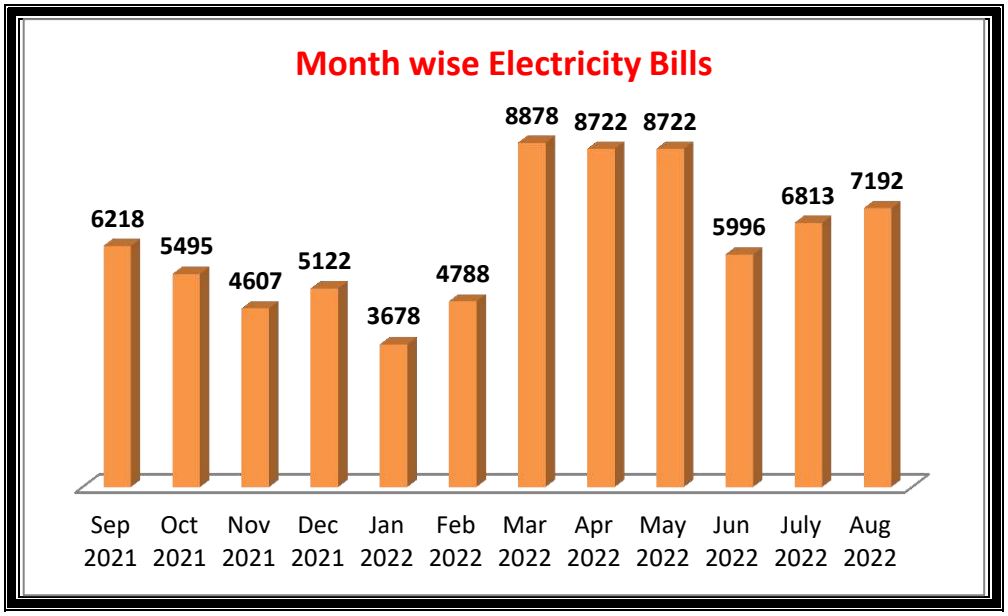
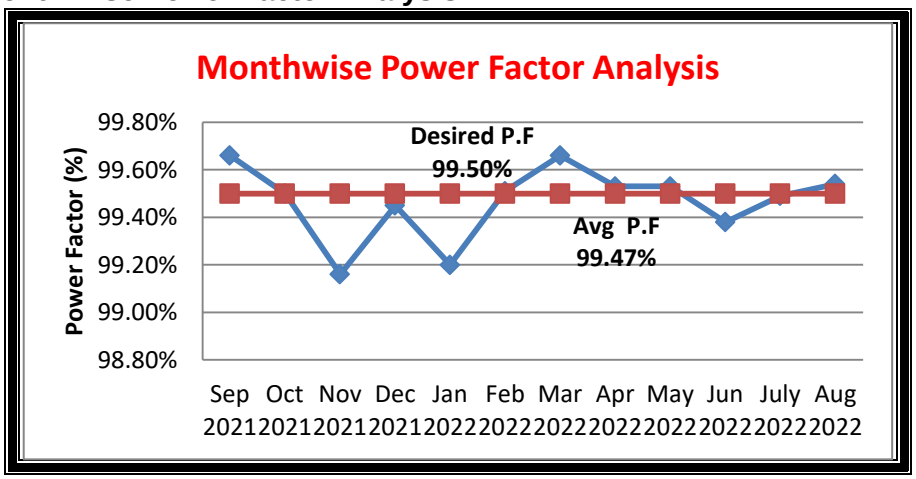
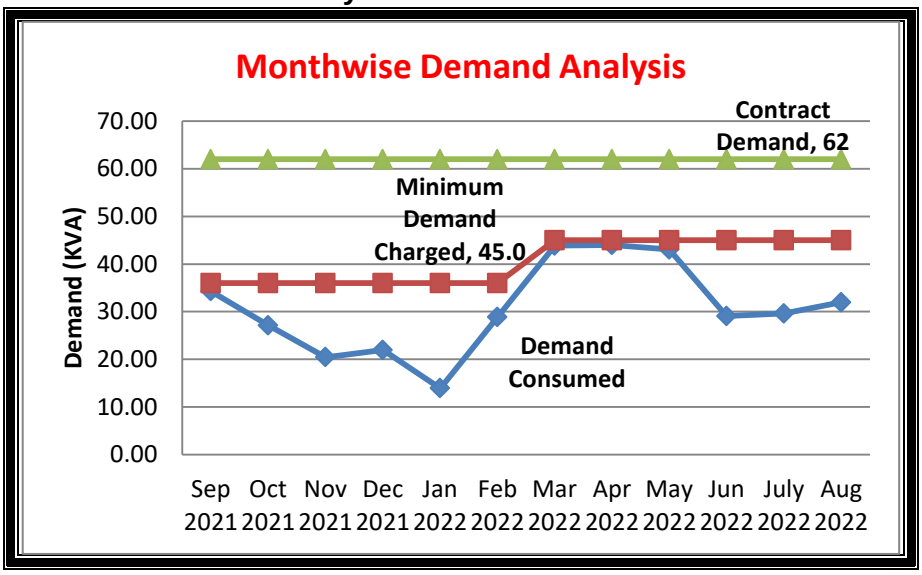


Month wise Power Factor Analysis



Month wise Demand Analysis



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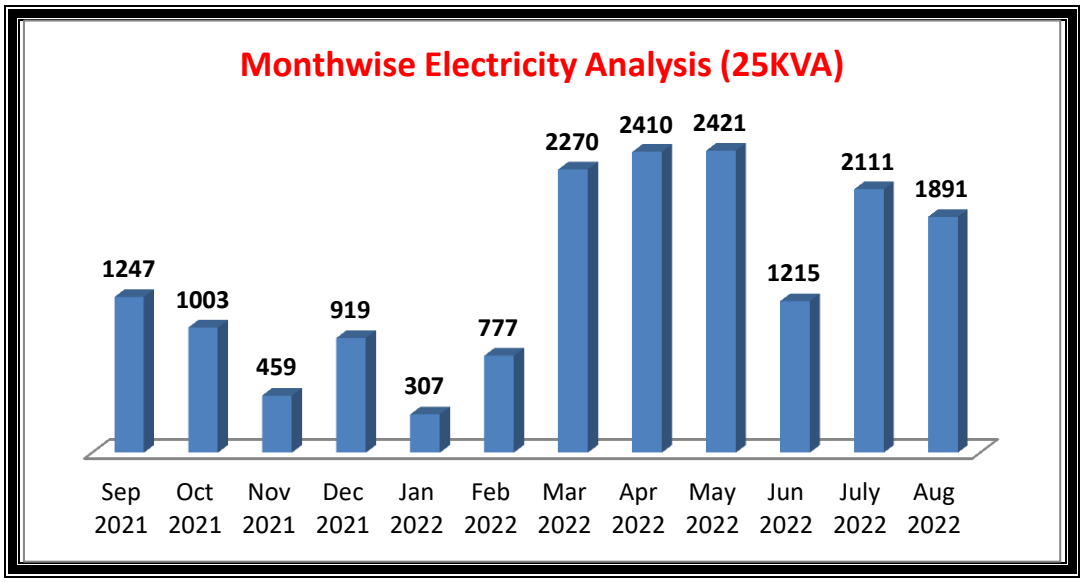
Monthly Electricity Bill Analysis (25 KVA)										
Month	Energy Consumption		Maximum Demand Recoded	Minimum Demand Charged	Demand Charges	Power Factor	Operating Hour	Average Load Factor	Electricity Charges (Net Payable)	Electricity Cost
	KWH	KVAH	kVA	kVA	(Rs)	(%)	Hr	(%)	(Rs.)	(Rs/ kWh)
Sep 2021	1247	1247	3.04	4.0	120	100.00%	720	56.97	9675	7.76
Oct 2021	1003	1003	3.04	4.0	120	100.00%	744	44.35	7746	7.72
Nov 2021	459	460	3.00	4.0	120	99.78%	720	21.30	3446	7.51
Dec 2021	919	921	3.24	4.0	120	99.78%	744	38.21	7082	7.71
Jan 2022	307	406	2.20	4.0	120	75.62%	744	24.80	2245	7.31
Feb 2022	777	777	4.24	4.0	120	99.99%	672	27.27	5960	7.67
Mar 2022	2270	2272	4.24	4.0	120	99.97%	744	71.98	17450	7.69
Apr 2022	2410	2411	4.24	5.0	150	99.99%	720	78.95	18826	7.81
May 2022	2421	2422	5.24	5.0	150	99.99%	744	62.11	18826	7.78
Jun 2022	1215	1215	4.12	5.0	150	100.00%	720	40.96	9330	7.68
July 2022	2111	2111	4.56	5.0	150	100.00%	744	62.22	16323	7.73
Aug 2022	1891	1891	4.10	5.0	150	100.00%	744	61.99	14606	7.72
Total	**17030**	**73,580**				**97.93%**		**49.26**	**131515**	**7.72**



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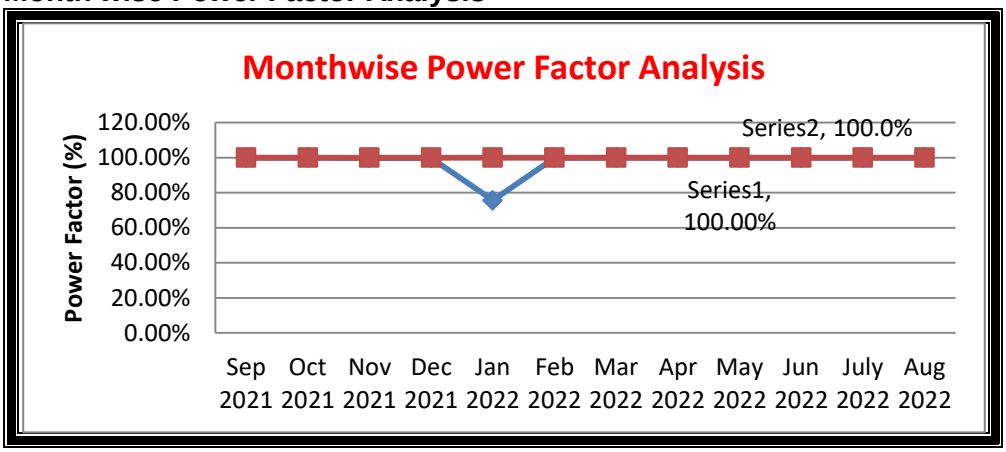
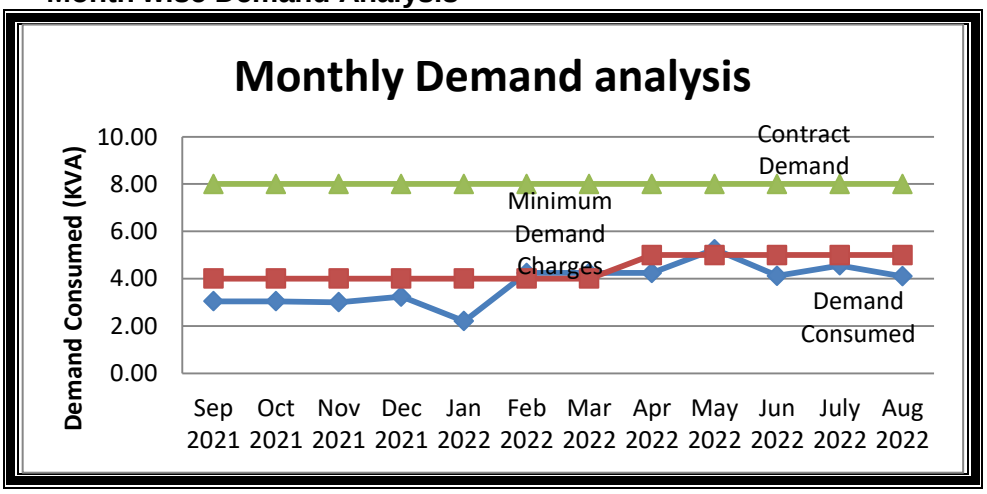
Month wise Power Factor Analysis



Month wise Demand Analysis



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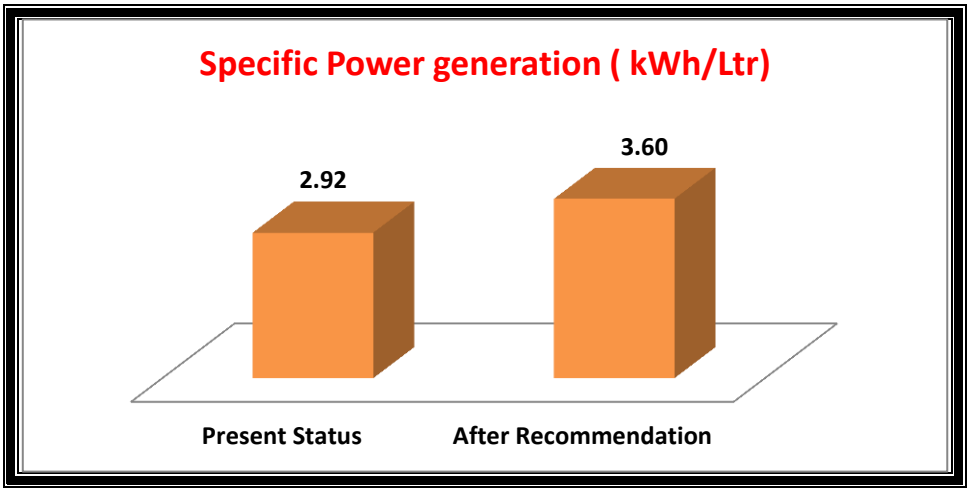
Analysis of Solar Power System Consumptions (17 KWp)			
Sl. No	Parameters	Unit	Description
1	Capacity of Solar Power System	KWp	17
2	Avg. Power Generation per day	kWh/Day	66.13
3	Avg. Power Generation per KWp per day	kWh/Day	3.89
4	Operating Days per Annum	Days	300
5	Annual Unit Generation	kWh	19839
6	Reduction of Emission	tCo2	18.85
7	Eq. energy Saving	(MTOE)	1.71
8	Operation and Maintenance cost	Rs	60000
9	Electricity Cost	(Rs/kWh)	3.02

Annual Energy Consumption in Canteen				
Sl. No	Parameters	Qty	Unit Cost (Rs)	Cost of Fuel (Rs)
1	Charcoal (Kg)	6000	17	102000
2	LPG (Kg)	1120	65	72800
				174800

Analysis of DG Sets Consumptions (35 KVA)		
Sl. No	Parameters	Description
1	DG Sets Rating (KVA)	35
2	Avg. Annual Running Hours (Hrs)	440
3	Fuel Consumption (Ltr/Hr)	3.52
4	Annual Diesel Consumed (Ltr)	1550
5	Annual Unit Consumed in kWh	4526
6	Specific Power generation (kWh/Ltr)	2.92
7	Reduction of Emission (tCo2)	4.19
8	Eq. energy Saving (MTOE)	0.02
9	Total Diesel Bill (Rs.)	147250
10	Electricity Cost (Rs/kVAh)	32.53



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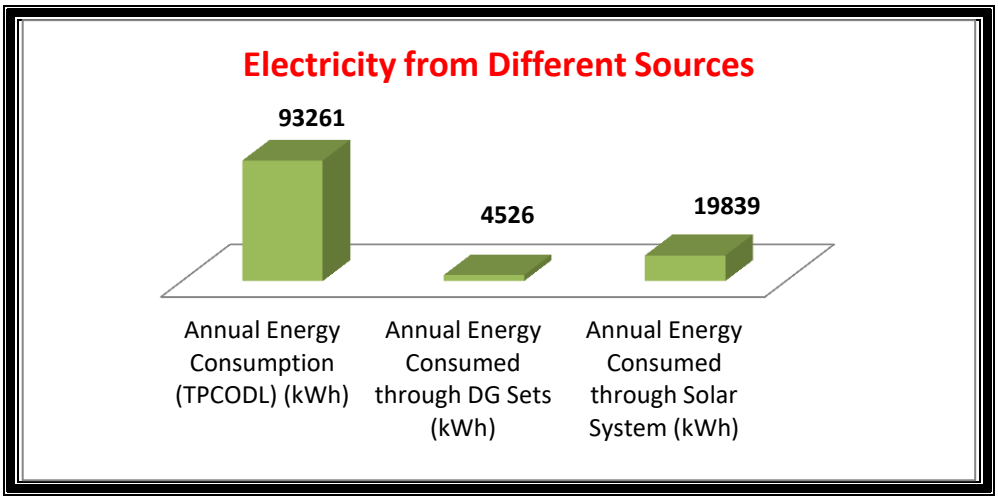
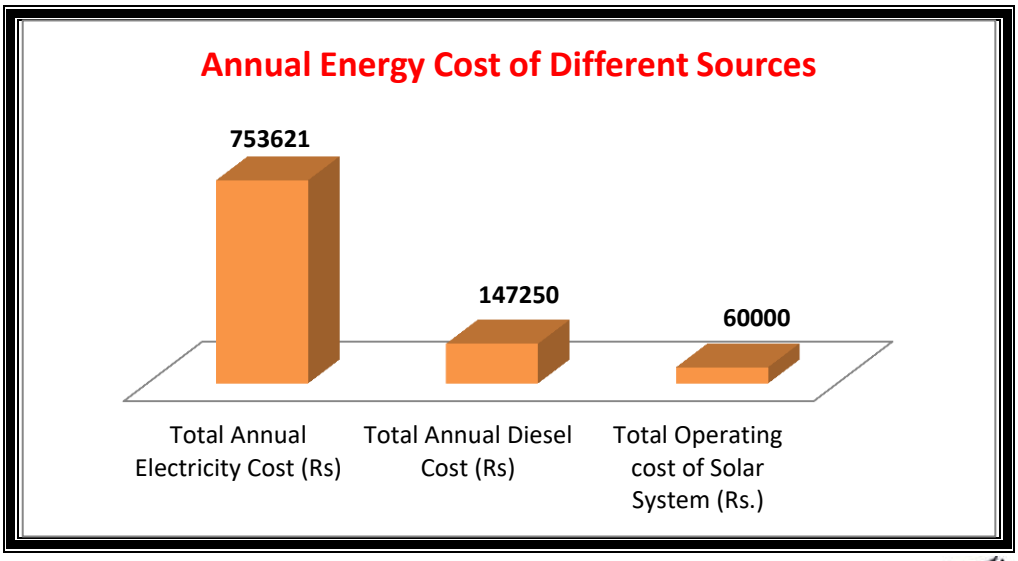
Cost of Electricity Calculation	
Parameters	**Description**
Annual Energy Consumption (TPCODL) (kWh)	93261
Annual Energy Consumed through DG Sets (kWh)	4526
Annual Energy Consumed through Solar System (kWh)	19839
Total Annual Energy Consumption (kWh)	117626
Total Annual Electricity Cost (Rs)	753621
Total Annual Diesel Cost (Rs)	147250
Total Operating cost of Solar Power System (Rs.)	60000
Total Energy Cost (Rs.)	960871
Unit Cost (Rs./kVAh)	**8.17**





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ENERGY EFFICIENCY MEASURES & ENERGY SAVING CALCULATION

Energy Conservation Measure: 1
Installation of Energy Efficient BLDC Fans

Replacement of old fans with BLDC fan				
Sl No	**Description**	**Unit**	**Present Status**	**Recommended Status**
	Type of Fan		**Traditional**	**BLDC**
1	Installed Average Capacity	Watt	100	28
2	No. of Fans	Nos	290	290
3	Total Power	kW	29.00	8.12
4	Load Reduction	kW	20.88	
5	Working Hours/day	hrs	8	8
6	Working Days/Annum	days	200	200
7	Annual Consumption (kWh/yr)	kWh	46870	12992
8	Average Unit Cost (Rs/kWh)	Rs.	8.17	8.17
9	Annual Energy Cost (Rs.)	Rs.	3,82,875	1,06,130
10	Annual Savings (kWh/ Annum)	kWh	33878	
11	Annual Savings (Rs/ Annum)	Rs.	276745	
12	Investment	Rs.	8,12,000	
13	Simple Payback Period	months	35	

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Energy Conservation Measure: 2
Retrofitting of Microcontroller AC Energy Saver

Retrofitting Microcontroller AC Energy Saver				
Sl No	**Description**	**Unit**	**Present Status**	**Recommended Status**
			AC, 5 Star-SAMSUNG	**With Micro Controller**
1	No of Split AC	Nos.	19	19
2	Tonnage of AC's	TR	1.5 & 2 Ton	1.5 & 2 Ton
3	Average Cooling Air Delivery	CFM	410	425
4	Average Cooling Output	Btu	17451	18089
5	Average Measured Tonnage	TR	1.45	1.51
6	Average Power Consumed	kW	1.66	1.46
7	Specific Power Consumption (SPC)	kW/TR	1.14	0.97
8	Energy Efficiency Ration (EER)	%	3.08	3.63
9	AC Running hours/Yr	Hours/year	990	990
10	Annual consumption (kWh/yr)	kWh/year	36432	26599
11	Annual Energy Savings	kWh/year	9833	
12	Percentage of Energy Savings	%	26.99%	
13	Average Unit Cost (Rs/kWh)	Rs./kWh	8.17	
14	Annual Savings (Rs/ Annum)	Rs/ Annum	80,326	
15	Investment (Rs)	Rs.	1,99,500	
16	Simple Payback period (months)	Months	30	

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Energy Conservation Measure: 3
Retrofitting of PIR Sensor for Lights and Fans

Retrofitting PIR Sensor for Lights and Fans				
Sl No	**Description**	**Unit**	**Present Status**	**Recommended Status**
	Type of Control		**Traditional**	**PIR Sensor**
1	Installed Capacity	Watt	7000	7000
2	No. of Control	Nos	Multiple	25
3	Working Hours/day	hrs	8	7
4	Working Days/Annum	days	250	250
5	Annual Consumption (kWh/yr)	kWh	14785	12937
6	Annual Savings (kWh/ Annum)	kWh	1848	
7	Average Unit Cost (Rs/kWh)	Rs.	8.17	
8	Percentage of Energy Savings	%	12.50%	
9	Annual Savings (Rs/ Annum)	Rs.	15097	
10	Investment	Rs.	30,000	
11	Simple Payback Period	months	24	

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Energy Conservation Measure: 4
Installation of EMS to Control and Monitor Sub Station, DG Sets, and ACs

Installation of Energy Management System to Control and Monitor Sub Station, DG Sets, and ACs				
Sl No.	**Description**	**Unit**	**Present Status**	**Recommended Status**
1	Total Load	kW	83.04	83.043
2	No of Control Panel	No	2	2
3	Monitoring of Parameter	Yes/No	No	Yes
4	Alert Facility on threshold limits	Yes/No	No	Yes
5	Automatic Control	Yes/No	No	Yes
6	Energy Savings	Yes/No	No	Yes
7	Average Operational Hrs/day	hrs	24	24
8	Nos of Operational days/Annum	days	365	365
9	Annual Power Consumption	kWh/A	93261	93261
10	Percentage of Loss Minimization	%	0%	2%
11	Distribution Loss/Annum	kWh	0	1865
12	Energy Saving/Annum	kWh	1,865	
13	Energy Cost	Rs/kWh	8.17	
14	Energy Cost Saving/Annum	Rs.	15237	
15	Cost Saving for Maintenance, Breakdown, Manpower, Increasing Life of Equipments	Rs.	20000	
16	Total Cost Saving/Annum	Rs	35237	
17	Investment for Energy Management System	Rs.	100000	
18	Payback Period	Month	34	

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Energy Conservation Measure: 5
Installation of Net Metering Solar Power System

Net Metering Solar Power System

Sl. No.	Description	Unit	Present Status	Solar System
1	Contract Demand	kVA/ kW	45	30
2	Shadow free Rooftop Area Available	Sq.Ft	4500	
3	Annual operating days	days/year		350
4	Average Power Generation/kW Solar PV	kWh/day		4.4
5	Annual Power consumption	kWh/year	117626	
6	Daily power generation	kWh/day		132.00
7	Annual power generation	kWh/year		46200
8	Energy cost	Rs/kWh	8.17	
9	Annual Energy Bill paid	Rs/year	9,60,871	
10	Expected Energy Saving with Implementation of all ECM	(%)	40	
11	Annual Energy Bill Payable after Implementation of ECM	Rs./Annum	5,76,523	
12	Annual Energy Cost Generated by Solar	Rs/year		3,77,402
13	Annual Energy Bill Payable after Implementation of Solar System along with ECM	Rs/year	1,99,121	
14	Investment for solar PV	Rs	16,50,000	
15	Payback Period	months	52	

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Energy Conservation Measure: 6
Retrofitting of Fuel Saver in DG Set

Retrofitting of Fuel Saver in DG Set				
Sl No	**Description**	**Unit**	**Present Status**	**Recommended Status**
1	No of DG Set	Nos.	1	1
2	Capacity of DG Set	KVA	35	20
3	Average Fuel Consumption/Hr	Ltr	3.52	19.85
4	Operational Running Hour/Yr	Hour/Yr	440	60
5	Annual Fuel consumption	Liters	1550	1191
6	Power Generation	kWh	4526	4526
7	Specific Power Generation	kWh/Ltr	2.92	3.80
8	Specific Fuel Consumption	Ltr/kWh	0.34	0.26
9	Average Fuel Cost	Rs./Ltr	95	95
10	Annual Fuel Cost	Rs./year	147250	113150
11	Annual savings	Ltr/ Annum	359	
12	Percentage of Fuel Savings	%	23.16%	
13	Annual Savings	Rs./year	34100	
14	Investment for Fuel Saver	Rs.	50000	
15	Simple Payback period	Months	18	

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Energy Conservation Measure: 7
Installation of Biogas Digester

Installation of Biogas Digester			
Sl No	**Description**	**Unit**	**Biogas Digester**
1	No of Persons	Nos	200
2	Availability of Food & Vegetable Waste/Day	Kg	15
3	Availability of Human Excreta/Day	Kg	80
4	Water Requirement/Day	Ltr	20
5	Bio Gas Generation/Day	M^3	8
6	Bio Gas Generation/Month	M^3	240
7	Bio Gas Generation (equivalent LPG)/Day	kg	3.36
8	Bio Gas Generation (equivalent LPG)/Annum	kg	1210
9	Slurry Generation/Day	Ltr	50
10	Bio Manure Production/Day	kg	5
11	Liquid Fertilizer Production/Day	Ltr	27
12	Cost of Bio Gas/kg	Rs.	65
13	Cost of Bio Manure/Kg	Rs.	10
14	Cost of Liquid Fertilizer/Kg	Rs.	1
15	Area Required	Sq.Ft	8Ft X 6Ft
16	Revenue Generated from Bio Gas/Month	Rs.	6552
17	Revenue Generated from Bio Manure/Month	Rs.	1500
18	Revenue Generated from Liquid Fertilizer/Month	Rs.	810
19	Total Revenue Generated/Month	Rs.	8862
20	Total Annual Profit	Rs.	1,06,344
21	Investment for Bio Gas Digestor, Waste Shredder, Moisture Remover, H2S Scrubber, Biogas Booster Pump, Biogas Canteen Burners and Electro-Mechanical Equipments	Rs.	3,00,000
22	**Payback Period**	**Months**	**34**

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Energy Conservation Measure: 8
Installation of Steam Cooking with Solar Water Heater

Installation of Steam Cooking with Solar Water Heater				
Sl No	**Description**	**Unit**	**Present Status**	**Solar Application**
1	Type of Cooking		Traditional	Steam Cooking
2	No of Meals preparation	Nos	200	200
3	Fuel Used		Coal	LPG+SOLAR
4	Calorific value of Coal cake	kcal/kg	3300	
5	Calorific value of LPG	kcal/kg	10800	
6	Annual Coal Consumption	Kg	6000	0
7	Annual Equivalent LPG Consumption	Kg	0	1833
8	Fuel saving	%		50
9	Annual LPG Consumption	Kg		917
10	Average Unit Cost of Coal	(Rs/Kg)	17.00	
11	Average Unit Cost of LPG	(Rs/Kg)	65.00	
12	Annual Coal Saving	KG	6000	
13	Annual Fuel Cost	(Rs.)	102000	59583
14	Annual Cost Savings	(Rs.)	42417	
15	Investment	(Rs)	450000	
16	Simple Payback Period	(months)	127	

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GREEN AUDIT REPORT OF ASTHA SCHOOL OF MANAGEMENT

For Green Audit, the following major areas including their sub-Sections were covered and compliance / initiatives under these area were verified / validated. Officers/Staff interviewed during Green Audit is at **Annexure I**.

- Good Day light Design and Ventilation
- Water Efficiency
- Waste water management
- Indoor Air Quality
- Energy Management
- On site energy Generation
- Solid waste management
- Universal Access and Efficient operation and Maintenance of Building
- Transportation
- Green Belt
- Green Programs (Green initiatives)

Good Day light Design and Ventilation

Class rooms, offices, library etc. have high ceiling, wide doors and large windows.

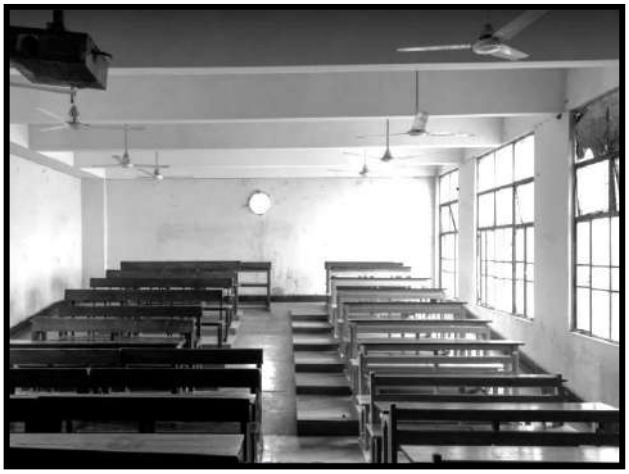
Building is designed in such a way that corridors and classrooms receive ample sunlight. Curtains are provided for windows to avoid glare. Natural light in the classrooms was about 70-85 lux.

Ventilation in class rooms is facilitated by windows and fans. Cross ventilation is facilitated due to large windows on both sides of some classrooms.

Air conditioners are used in offices, computer laboratory and computer server rooms.

Exhaust fans are provided in wash rooms and kitchen.

Blinds and exhaust fan in Computer Lab



Natural light in class room

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Water Efficiency

Major water source for Astha School of Management is ground water drawing through one sub mercible pump of 1.5 HP and other one is open pump set of 1.5 Hp. As informed by School's water management team, daily water consumption for the entire campus, when in full operation, is 23 KL, which includes 5 KL consumption in academic area and 18 KL for Canteen use, Wash room use by Hostel inhabitants and gardening. As per IS1172 standards (http://dasta.in/wp-ontent/ uploads 2015/04/CB Code 2002.pdf) for non-residential institutions, water consumption should be maximum 45L/person/ day.

There is no water bill provision as it is not coming under Municipality water supply system.

The quantity of Water used varies depending on the full functioning / partial functioning of Academic activities and hostel strength.

No underground water provision for storing of water. Water is directly lifted to Overhead Tank of Three numbers of capacity of 5000 L,.5000 L and 8000 L respectively. using 1.5 HP sub-mercible pump and 1.5 hp pump for 2-3 times in a day and then distributed to wash rooms, basins ,kitchens and water purifiers / coolers installed in the School building. The responsibility for purification and maintenance of OHT is discharged by School water management team and maintenance is done by 3rd party contractor appointed by School. Maintenance is done once in 3 months.

Water purifier

Waste Water Management

Waste water is mainly generated from washing, toilet flushing, canteen and kitchen. Total 15
Wash rooms are provided in the School Academic building.

Currently, sanitary waste water generated is sent to open unused area . Sewage treatment plant of 100 KLD capacity is under construction for the treatment of sanitary waste water generated in the campus. STP will comprise of primary and secondary treatment (biological treatment) followed by filtration.

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Indoor Air Quality
Indoor Air Quality (IAQ) refers to the air quality within & around buildings and structures. it related of the health and comfort building occupants. Common indoor pollutants are listed as below:

- Carbon monoxide–Sources of carbon monoxide are incomplete combustion of fossil fuels

- Volatile organic compounds (VOCs) – VOCs are emitted by paints and lacquers, paint strippers, pesticides, office equipment such as copiers and printers, correction fluids and carbon less copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions etc.

- Carbon dioxide –Due to human respiration
- Particulate matter–Due to construction and maintenance activities, vehicular pollution
- Nitrogen Oxides-Due to vehicular pollution

Kitchen in the canteen use liquefied petroleum gas(LPG), a clean fuel.

In classrooms, the mode of ventilation is natural draft (through windows) and is enhanced by fans. Large windows and cross-ventilation are observed in corridors.

Air conditioners are used in some offices and computer laboratories. ACs are serviced regularly to ensure indoor air quality.

The wash rooms are provided with exhaust fans so that the bad odor is safely discharged outside the building.

On-Site Energy Generation

Usage of LPG
LPG cylinders are used mainly in canteen kitchen for cooking. Inventory of cylinders usage was not available for review. One cylinder of 19 kg generates 881.6 MJ (Mega Joules) of energy.

Storage facility for LPG cylinder is located on ground floor. All the commercial LPG gas cylinders were in vertical position with access control. However, Management is taking steps to provide extra support system like chain in order top cylinders from falling, movement or physical damage.(http://peso.gov.in/Work_Mannual/Gas_cylinder_Rule_WM.pdf) Campus has a diesel generator(DG) of capacity 35 KVA.DG set is used only in case of emergency when there is power cut –off. DG emissions are not monitored.

Solar Power System
Off grid Rooftop Solar PV System of 17 KWP capacity has been installed in December 2021 by Management. Solar panels' cleaning is done by School's maintenance team as it comes under purview of School Management because of off grid system.

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Solid Waste Management

Solid waste generated from campus includes mainly paper waste, wet (food/ organic) waste and E-waste.

Blue and Green covered/ pedal-pushed dustbins are placed in the premises. Waste bins are provided on each floor in staff rooms, wash rooms, kitchen and in campus area.

Daily around 20-25 kg organic/ bio-degradable waste is generated in the campus which includes horticultural waste. Quantity of horticulture waste varies significantly due to seasonal variation, e.g. around 30-40kg of horticulture waste is generated daily in February-March due to leaf fall.

School has Vermin Composting unit for the treatment of Garden waste which was dismantled during construction of new building. Recently School is going to install a new Vermi Compost unit.

.

There is two waste generated pit (5x1x1 m) for the treatment of horticulture waste generated in the campus. The unit is in operation. .

ASM being a School with non- residential facility, the quantity of wet (food/ organic) waste generated in the premises is minimum. Bio-degradable wet waste is mostly generated from the Canteen. School has initiated the process of installing a composting unit of 25-30 kg/ day capacity for the treatment of Canteen waste and Garden waste .Composting unit is also in operation..Other wastes generated such as class rooms paper waste and plastic wrappers. Presently it is collected & given to Vendors for further processing at their end.

Segregation of wet and dry waste is done within the campus. However, there is no signage for promoting segregation of wet and dry waste.

Paper Waste Management

Being an academic institution, waste paper is one of the main solid wastes generated in the premises. School has taken steps to minimize paper waste.

Dustbin in campus area

Prints and photo copies are taken on both sides of the paper to avoid excess paper usage. Scanning/Digitization is preferred to photo copy.

Library has an e-book facility having 6000+ e-journals, and 7,64, 300+ e-books available online through different portals such as INFLIBNET, National Digital Library. One

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computer room is provided in the library to access online services.

Internal notices and communications are done through e-mail/ SMS. School has a Learning Management System (LMS) where notices are sent, Exam results are displayed and attendance is recorded digitally.

The School encourages students to use eco-friendly material and recycle old papers/ scrap for decoration purposes during School festivals.

Computer room in the e-library

Vermin Compost Unit

E- Waste Management

E-waste is broadly comprised of discarded computer monitors, mother boards, mobile phones and chargers, compact discs, head phones, Printed Circuit Boards (PCB), televisions etc.

School is digitized to a large extent. This includes class rooms, library, LMS for academic work etc.

School has 118 computers, 9 projectors, 38 air conditioners in working condition.

E-waste is collected & stored in School campus and sent to authorized vendor for recycling/ disposal under buy-back policy. E-waste documents information has not been maintained. It is advised to record the details E waste item wise before handing over to the vender.

Plastic Waste

School strictly follows the guidelines regarding plastic usage and has prohibited the use of single use plastic e.g. carry-bags, glasses, spoons etc in the campus.

As per the School guidelines, Canteen Contractor is prohibited to use plastic cutlery, instead paper plates and wooden spoons are used.

Universal Access and Efficient Operation and Maintenance of Building

Stair cases and class rooms have wide windows, which can allow safe evacuation during emergency. Handrails are provided on all staircases.

Total 17 fire extinguishers are on the verge of installation in the corridors of all floors, computer laboratories, kitchen area. and in Hostel campus. As per the Audit Co-

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Ordinator, they will make AMC with the supplier company for regular maintenance.

Sand buckets (around 16 nos) are likely to be provided on each floor for firefighting purpose.

There were no signage for emergency fire exit. This is crucial during emergency.

First Aid boxes are provide & maintained in Seek Room to meet the problem in Distress.

ASM has prepared detailed emergency response plan for disaster management for natural calamities like earthquake, thunderstorm and other hazards such as fire, structural collapse, food poisoning, chemical spill.

Transportation

School has vehicle-free campus. Dedicated space for parking has been allotted in the specific area near to pond. Vehicle movement and parking in the main campus is prohibited.

Green Belt/ Landscaping

School campus has a garden (including rock garden and rose garden) and an herbal garden. School has1.08 acre green belt area having 300 variety of plants (including 57 tree species), 427 trees, shrubs and 400-500 potted plants.

Plantation improves aesthetic environment. Sand helps as a buffer in reducing noise level, maintaining temperature of the area. Herbal garden has different sections in which specific types of plants planted with respect to the medicinal importance.

As per the findings of internal green audit conducted by School, large trees include Peepal (*Ficusreligiosa*), Goolar (*Ficusracemose*), Pilkhan(*Ficusvirens*), Ashok(*Saracaasoca*), Jamun(*Syzygiumcumini*), Mango (*Mangifera indica*), Kadamb (*Neolamarcki acadamba*), Bael (*Aeglemarmelos*), Gulmohar (*Delonixregia*), Champa (*Magnolia*champaca),KanakChampa
(*Ptero spermum acerifolium*), Semal (*Bom baxceiba*) and Neem (*Azadirachtaindica*)etc. Few trees were identified and confirmed during virtual tour. A List of trees is placed at **Annexure II**

School has indoor plants in the building. .Indoor plants have health benefits. List of few indoor plants potted and their benefits are presented in **Annexure III.**

Green belt in campus

Indoor Plants

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Green Initiatives

Due to minimum consideration for environment & sustainability, the world is facing problems of ozone depletion, climate change, water scarcity and sustainable resource management. School organizes guest lectures on environmental conservation, biodiversity etc. every year.

School has demonstrated consistent commitment towards nature and environment for the last year. School has **'Eco Club'** and the **Garden Committee** which offers wide spectrum of environmental and nature activities and platforms to enhance awareness and exhibit the relationship with nature. Students also participate in innovative workshops and campaigns like solar lamp making, refill the pen campaign, campaigns for discouraging the use of polythene, etc. Visit to bio-diversity parks, wet lands and other places of ecological importance are also being arranged by Eco Club. In the current scenario when academic activities are taking place virtually, School arranges webinars, online conferences pertaining to environment. Records of all activities are being maintained by the School.

School campus was audited with respect to Green Audit. Based on the data available for review, it is understood that since last 3 years. School is actively taking initiatives in environment related activities. School has taken green initiatives by installing conserving rain water through harvesting system, vermin composting , establishing Eco Club, promoting eco-friendly activities etc.

Buildings are specifically designed with wide windows and wide passages to utilize sunlight, and for ventilation.

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Recommendations

1. School has implemented several green initiatives such as rainwater harvesting, Vermi Composting, Solar PV system and is under process for installation of Sewage Treatment Plant. It will help in promoting sustainability.

2. Water consumption can be reduced further through various conservation methods. Replacement of all old water faucets with water saving faucets such as press mastic taps, aerator taps, jet sprays etc to save water and help in minimizing the water footprint.

3. Treated sanitary waste water can be recycled for toilet flushing by providing dual pumping system.

4. School should test water quality at regular intervals, develop water demand/ balance diagram and plan delineating water conservation practice.

5. Records of pipe/ water taps leakage complaints should be maintained as a part of Standard Operating Procedures (SOPs).

6. Solid waste generated in campus includes paper waste, E-waste, plastic waste, food waste from canteens and dry recyclable waste from gardening. Paper waste and E-waste are given to approved agencies for recycle/ disposal. Inventories & management processes of all waste (including food and dry recyclable waste) should be well documented.

7. Digital Display Screen is to be provided at ground floor for display.

8. Signage regarding water conservation, reduction & segregation of plastic waste, reduction in food waste, waste segregation is required to be provided in kitchen, dining areas and near drinking water facilities to create awareness among staff and students.

9. Mirror optic reflectors can be retrofitted with existing tube lights as the reflectors spread light to relatively large areas. Control sensors help to reduce consumption by automatically dimming lights when people are not around.

10. School is procuring LED lights and electrical equipment with star ratings. SOPs should be prepared and followed for procuring green equipments, eco-friendly materials with star rating.

11., The installed solar energy system capacity could be expanded to the remaining roof top area to generate more renewable energy.

12. It is recommended that indoor air quality, noise levels and water quality to be monitored once in 6month and records to be maintained as per IS: 10500, https://scclmines.com/env/DOCS/NAAQS- 2009.pdfhttp://cgwb.gov.in/Documents/WQ-standards.pdf

13. Information on sources, impacts and mitigation of indoor air pollution is to be displayed within campus for increasing awareness about indoor air pollution.

14. It is recommended to measure emissions from diesel generator and ambient air quality at least once in a year.

15. There should be a schedule for safety training, fire-fighting drills and mock drills. Records of these activities should be maintained.

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16. Safety, Health and Environment (SHE) groups can be formed which will include staff members andstudents. They can have regular meetings, and suggestions to be recorded and implemented, if found suitable.

17. Emergency escape route plans should be provided on each floor. Floor plan should be clearly visible with an emergency exit and assembly point.

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Annexure - I

Stake holders Interviewed

Physical tour of Astha School of Management was conducted on17.10.2022.During the visit, School campus, School building (classrooms, library, etc.), solar panels, rain water harvesting system, Green belt, RO plant, LPG storage area were verified.

Following stakeholders were interviewed.

Sl. No.	Stakeholder's Name	Designation
1	Dr. Bankim Mohanty	Executive Director Cum Secretary, Astha school of Management
2	Prof. (Dr.) Sharmila Subramanian	Principal, Astha School of Management
3	Mr. Bijaya Kumar Patra	Chairman
4	Mr. Hrudananda Pradhan	Sr. Executive cum Audit Coordinator
5	Mrs Jharana Rout	Librarian
6	Mr. Maheswar Sahoo	Gardner
7	Mr. Ashok Kumar Behera	Water and Fire Management
8	Mr. Sanjib Kumar Mishra	Computer Laboratory In-charge

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Annexure-II

List of Plant Species:

Common Name	Botanical Name	No. of Plant Species
Mango	Mangifera indica L.	10
Jackfruit	Artocarpus heterophyllus	03
Gulmohar (Krushnachuda)	Delonix regia	04
*Foetid cassia (*Chakunda)	Cassia tora	02
Sacred Fig (Peepal)	Ficus religiosa	05
Black Plum (Jamun Koli)	Syzygiumcumini L	02
Hazel Tree	Corylus avellana	15
Sandal Wood (Chandan)	Santalum album	04
Pam Tree	Arecaceae	110
Chikoo (Sapeta)	Manilkara zapota	10
Cactus	Cactaceae	02
Oleander	Cascabelathevetia	06
Guava	Psidium guajava	15
Eucalyptus	Eucalyptus globulus L.	03
Jhaun	Tamarisk	03
Litchi	Litchi chinensis	02
Drumstick	Moringa oleifera	03
Banana	Musa acuminata	20
Berry	Ziziphus mauritiana	02
Pistachio (PistaBadam)	Pistacia vera	20
CashewNut (KajuBadam)	Anacardium occidentale	01
Hibsiscus	Hibiscus rosa-sinensis	10
Lemonwood (Tarata)	Pittosporum eugenioides	17
Custard Apple	Annona reticulata	03
Bakula (Spanish Cherry)	Mimusopselengi	22
Papaya	Carica papaya	15
Debdaru	MonoonLongifolium	25
Rose Jasmine (Malli)	Jasminum Polyanthum	15
Aquilaria	Aquilariamalaccensis L.	30
Champak	Magnolia champaca	02
Rose	Rosa rubiginosa	15

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Annexure III

Indoor Plant Details

Indoor plants are commonly used for their aesthetic benefits but they also play a vital role in reducing air borne pollution. The right choice of plants can be an excellent way in improving indoor air quality and general health Local and scape contractor can be contacted for supply and rotation of the plants.

Plants	VOC itre moves	Indoor source of VOC's	Plant care
 **Aloe Vera**	Formal dehyde, Trichloroeth -ylene and Benzene	Chemical based cleaners and paints	Easy to grow with enough sunlight
 **Bamboo Plant**	Formal dehyde, Trichloro ethylene and Benzene	Paints, Plastics, Wood products etc.	Thrives under lowlight conditions as well as easy to maintain
 **Chinese Evergreen**	Benzene	Paints	Low maintenance plant that prefers low light conditions.
 **English Ivy**	Formaldehyde, Benzene, Airborne fecal matter particles	Wood, Paper products, Airborne faecal –matter particles from pests	Easy to maintain
 **Janet Craig**	Formaldehyde, Benzene and Trichloroethylene	Paints, Plastics,Wood products etc.	Medium to lowlight tolerant plant. Requires little water for growth.

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 **Golden Pothos or Devilslvy**	Formaldehyde, Cleanses air	Exhaust fumes,carpeting materials, panelling and furniture products made with particle board	Extremely easy to maintain under low to bright light Conditions. Fast growing and grows well under Fluorescent light.
 **Mass Cane**	Formaldehyde, benzene and trichloroethylene	Paints, Plastics, Wood Products etc.	Medium to low light tolerant plant. Requires little water for growth.
 **Snake plant**	Formaldehyde and trichloroethylene	Cooking fuels, wood products, facial tissues, personal care products and Waxed papers	Drought resistant and Tolerates a variety of light conditions. Hard to damage or kill.
 **Peace Lily**	Formaldehyde, benzene and trichloroethylene	Paints, Plastics, Wood products etc.	Relatively easy to maintain. Survives in lowlight conditions.
 **Red-edged Dracaena**	Formal dehyde and trichloroethylene	Cooking fuels, wood products, facial tissues, personal care products and waxed papers	Drought resistant and Tolerates a variety of light conditions. Hard to damage or kill.

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Annexure - IV

Green & Energy Audit Checklist

School campus is audited with respect to Green Audit Checklist developed by KEC. School buildingis specifically designed with broad windows and wide passages to utilise sunlight and for ventilation. School has ample number of trees in the campus. Facilities such as rainwater harvesting system, rooftop solar PV systems are provided in the campus. STP is under construction.

Students and staff demonstrate consistent efforts in arranging environmental activities and actively participate in them.

Good Daylight Design

Sr. No.	Design Feature	Remarks (If any)
1	Wide corridors open to daylight	
2	Broad doors and windows allowing daylight	
3	Building architecture which allows sunlight within buildings	Specifically designed with broad windows and wide passages
4	Presence of Skylight/ Rooflight	Large number of trees and herbal garden are present in the premises.
5	Enough natural illumination in classrooms/ seminar halls/ laboratories	Wide windows provided for natural sunlight.
6	Ultraviolet (UV) filtering windows/ Use of exterior louvers or light coloured fabric orblinds for windows to control glare	Light coloured curtains or blinds used for laboratory windows
7	Operable/ openable windows	
8	Use of glass as facilitator of natural light	
9	Use of insulated and tinted glass to filter heat gain	

Ventilation

Sr. No.	Design Feature	Remarks (If any)
1	Good ceiling height which allows internal air circulation	Height- about 4 m
2	Self-movement ventilators in the roof	
3	Wide windows and doors for classrooms, laboratories, seminar halls	
4	Wide corridors	Width- 2- 2.5 m
5	Operable louvers	
6	Exhaust fans in kitchen/ toilets	Exhaust fans are provided in laboratories, wash rooms and kitchens.

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Temperature and Acoustic Control

Sr. No.	Design Feature	Remarks(If any)
1	Roof design & type (Double/ False ceiling with plaster of paris etc.)	All roofs are false ceiling made from plaster of paris.
2	Sand stone cladding/ tiling outside the walls	
3	Specially designed walls for temperature control, Sound noise barriers for windows/ walls	
4	Building construction allows diffused sunlight but not the heat. Specially designed glass walls/ windows withbetter U value/ factor depending upon climate conditions	
5	Use of insulation material (e.g. autoclaved aerated blocks, hollow blocks, Thermocrete etc.)	
6	Use of water bodies/fountain to maintaintemperature within building	
7	Climbing creepers on the walls	
8	Retrofitting the existing roofs with cool roof technology	
9	Use of landscaping as sound barrier	Trees and shrubs are planted in theCampus. Indoor plants are also placed in the building.

Water Efficiency & Wastewater Management

Sr. No.	Measures	Remarks (If any)
1	RO based water purifiers for drinking water	
2	Aerators to water taps	Limited. Present only in some Wash rooms.
3	Automatic toilet faucets	
4	Drip irrigation/ Sprinklers (for plant watering system)	Sprinklers are provided in gardens.
5	Dual flush toilet with cistern	Dual flush is important for reducing water footprint.
6	Dry mopping/ cleaning methods adopted	
7	Sewage treatment plant for sewage recycle	STP of 130 KLD capacity is under construction.
8	Rainwater harvesting	RWH is provided in the campus.
9	Regular maintenance for leakage free plumbing system	Maintenance is done by maintenance department.
10	Use of low flow/flow control water equipment or gadget	

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11	Water free urinals (No flush urinals/ Zeroflush urinals/ water less urinals/ air-based flushing system)	
12	Water balance diagram and waterconsumption monitoring at each consumption level	Water consumption monitoring at each level is essential to identify major water consumption areas.
13	Routine monitoring of water quality	
14	Awareness signs displayed for promoting water conservation	Water conservation signage to be displayed to create awareness among staff and students.

Energy Efficiency and On-site Energy Generation Mechanism

Sr. No.	Measures	Remarks (If any)
1	Maintaining correct lux levels (70-300 lux)to avoid excessive light	The illumination (Lux) levels were adequate in most areas (70-115 luxsunlight). Lights are kept switched off when not required.
2	Computerized monitoring of electrical system	
3	On-site energy generation (Diesel generators, LPG)	Diesel generator of capacity 100 KVA is provided. LPG is used in kitchen and laboratories.
4	Use of renewable energy (Solar, biogas)	Rooftop solar PV system of 75 KWHcapacity is installed.
5	Photocell occupancy sensor for automatic light control	
7	Regular maintenance of electrical system	On-site maintenance department is present for regular maintenance.
8	Use of energy efficient equipment like VFDs, maximum star rated equipment.	All ACs are with star rating. 30% lights are LEDs.
9	Use of energy saving bulbs (Compact florescent light/LED lights)	30% lights are LEDs.
10	Awareness signage on electricity conservation	Electricity conservation signage areprovided on laboratory notice boards. Signage should be provided near all switch boards.

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Solid Waste Management

Sr. No.	Measures	Remarks (If any)
1	Waste segregation practices and supporting hardware for waste segregation (Dry recyclable, organic, plastic, hazardous and E waste)	Dry recyclable waste, e-waste and paper waste segregation is practised.
2	Setting up recycling / composting/ biogas generation facility	Campus has vermin composting facility and is planning to install composting unit.
3	Minimise use of paper through digitalization	'Learning Management System' has helped in reducing paper use.
4	Printing on both sides of paper/ Reuse of printed paper/ envelops	
5	Mechanism for collection & disposal of E-waste as applicable regulation	E-waste is stored and handed over to 'Nishta Innovative Solutions'.
6	Single use plastic free campus	School has prohibited the use of single use plastic.
7	Inventories of waste generation and records of waste disposal	
8	Recycle/ archiving of paper waste	Paper recycling unit is installed in the campus.
9	Segregation of dry and wet waste	Blue and green coloured bins are installed for segregation.
10	Purchase of electronic products from companies which have service for disposal of product with buyback policy	
11	Recreating into new sustainable products	Waste materials are being used bystudents for projects and during festivals.

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Environmental Audit

Sr. No.	Type of audit	Remarks (If any)
1	Energy audit (includes energy consumption, thermal comfort, visual comfort)	Energy Audit helps to assess existing energy balance, implement energy efficient operational strategies and adopt Energy Conservation Measures (ECM) effectively.
2	Sound/ Noise and lux level monitoring (including indoor noise level, outdoor noise level)	School has conducted environmental audit in June 2021.
3	Water and waste audit (including water consumption, quality, solid waste generation, solid waste disposal process)	
4	Safety Audit	It is recommended to conduct safety audit to identify the improvement opportunities and increase safety awareness.

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Universal Access and Efficient Operation and Maintenance of Building

Sr. No.	Design feature	Remarks (If any)
1	Easy access to the main entrance of the building and minimum two exits	Maintained
2	Energy efficient elevator	
3	Carpooling by staff and students/ use of Public transport/ Use of bicycles and battery-operated vehicles within campus	Most students use public transport. Carpooling is practiced by School staff.
4	Preferred car park spaces for differently abled personnel	
5	Ramp/ stairs with hand-rails	Handrails are installed on all staircases. Ramp to be installed at crucial places such as the main entrance.
6	Restrooms (toilets) in common areas/ Restroom for differently abled	Separate restroom for differently-abled is not provided.
7	Braille assistance for differently abled	Braille kits, audio books are present in the library.
8	Availability of wheel chair	
9	Emergency response plan for natural and manmade emergencies	
10	Fire exits, assembly points, first aids,firefighting systems	First aid kits are provided in specific Treatment room. Fire extinguishers andsand buckets are provided. Fire exit signage should be installed.
11	Regular maintenance of building	In-house maintenance department is present.

Green Program

Sr. No.	Green program	Remarks (If any)
1	Up cycling of waste. Recycling beyond books i.e. paper, aluminium, plastic, e-waste	Dry waste is used by students for projects and during festivals for decoration purpose.
2	Creation of "Green Team" in the institution/library	School has **Eco Club** and **Garden Committee.**
3	Awareness programs on environment, energy management & safety (externalsessions and academic courses)	Each course has at least one environment related subject. Awareness sessions are arranged for student and also by faculty & students in nearby area.
4	Outreach, activities, green programs (Tree plantation, waste segregation, plastic waste collection, cleaning etc.) records/ photos of programs	

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5	Presence of system/ methodology available for implementation of green initiatives and green projects (long term system-based continuity and not an isolated/ standalone activity)	
6	Mindset for reduction, recycle of waste(Green mindsets)	Students are motivated to recycle waste materials. Awareness programs are being conducted with the campus as well as in nearby area.
5	Digitization	
6	E-archiving	
7	E-resources: E books, Online Journals, membership of consortium	
8	Maintaining green campus / Greening of campus	Campus has 1800+ large trees, shrubs and potted plants.

□: Provided P: Planned/ under construction - : Not Applicable X : Not Provided

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Annexure - V

Load Details & Unit Consumption of Astha School of Management (Office Building)							
Sl.No	**Equipments use**	**Load (Watt)**	**Nos**	**Load (KW)**	**Operating Hours/Day**	**Annual operational Days**	**Total Unit Consumed (kWh)**
1	A.C 2 Ton	2200	8	17.60	5.5	180	17424
2	A.C 1.5 Ton	1800	10	18.00	5.5	180	17820
3	A.C 1 Ton	1200	1	1.20	5.5	180	1188
4	Ceiling Fan	80	133	10.64	6	200	12768
5	Wall Fan	150	23	3.45	6	180	3726
6	Pedestal Fan	200	2	0.40	6	180	432
7	Exhaust Fan	200	6	1.20	6	180	1296
8	LED Down Light	20	11	0.22	6	200	264
9	LED Bulb	15	36	0.54	6	200	648
10	LED Bulb	9	76	0.68	6	200	821
11	Decorative Light	10	5	0.05	6	200	60
12	LED Street Light	1000	3	3.00	12	365	13140
13	LED Street Light	85	3	0.26	12	365	1117
14	LED Street Light	45	4	0.18	12	365	788
15	LED Street Light	25	2	0.05	12	365	219
16	Computer	50	122	6.10	6	200	7320
17	Printer	250	6	1.50	2	200	600
18	Scanner	150	1	0.15	1	200	30
19	Xerox	600	1	0.60	0.5	200	60
20	Projector	275	10	2.75	3	200	1650
21	Fax	180	1	0.18	0.5	200	18
22	LCD TV 42 inch	200	1	0.20	3	200	120
23	DVR	300	1	0.30	2	200	120
25	wi-fe	10	4	0.04	10	200	80
27	Aqua guard	10	1	0.01	12	200	24
28	SMPS Camera	2	1	0.00	24	200	10
29	Bio Matic	10	1	0.01	8	200	17
Total				**69.31**			**81760**

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Load Details & Unit Consumption of Astha School of Management (Girls Hostel)							
Sl. No	**Equipments in use**	**Load (Watt)**	**Nos**	**Load (KW)**	**Operating Hours/Day**	**Annual operational Days**	**Total Unit Consumed (kWh)**
1	Ceiling Fan	80	30	2.4	10	250	6000
2	Exhaust Fan	120	15	1.8	10	300	5400
3	LED Bulb	20	35	0.7	6	300	1260
4	LED Bulb	12	22	0.264	6	300	475.2
5	LCD TV	45	3	0.135	4	300	162
6	Wi-fe	5	3	0.015	12	300	54
7	Aqua guard	10	3	0.03	12	300	108
Total Load (KW)		**4.21**		**5.344**			**13459**

Load Details & Unit Consumption of Astha School of Management (Boys Hostel)							
Sl.No	**Equipments use**	**Load (Watt)**	**Nos**	**Load (KW)**	**Operating Hours/Day**	**Annual operational Days**	**Total Units Consumed (kWh)**
1	Ceiling Fan	80	30	2.4	15	250	9000
2	Exhaust Fan	120	15	1.8	12	300	6480
3	LED Bulb	20	35	0.7	6	300	1260
4	LED Bulb	12	22	0.264	6	300	475
5	LCD TV	45	3	0.135	6	300	243
6	wi-fe	5	3	0.015	12	300	54
7	Aqua guard	10	3	0.03	12	300	108
Total Load (KW)		**4.21**		**5.344**			**17620**

Load Details & Unit Consumption of Astha School of Management (Canteen)							
Sl.No	**Equipments use**	**Load (Watt)**	**Nos**	**Load (KW)**	**Operating Hours/Day**	**Annual operational Days**	**Total Unit Consumed (kWh)**
1	Ceiling Fan	80	20	1.60	6	150	1440
2	Table Fan	100	1	0.10	4	100	40
3	Exhaust Fan	120	2	0.24	6	200	288
4	LED Bulb	9	1	0.01	6	200	11
5	LED Bulb	20	1	0.02	6	200	24
6	Aqua guard	10	1	0.01	6	200	12
7	Freeze	160	2	0.32	24	200	1536
8	Freezer	200	1	0.20	24	200	960
9	Coffee Maker	300	1	0.30	6	200	360
10	Grinder	200	1	0.20	2	200	80
11	TV	45	1	0.05	4	200	36
Total Load (KW)				**3.04**			**4787**

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Annexure - VI

Photo Gallery

Entrance Gate of Astha School of Management

Solar Pannel odf 17Kw on Terrace of School

Lightening Arrestor of ASM

Entrance of ASM From Public Road

Proposed Building Gesture of Astha School of Management ,

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