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REPORT ON ENERGY AUDIT OF KALIABOR COLLEGE NAGAON, ASSAM

This report is prepared for period from July,2023 to June,2024.

K. TALUKDAR. Energy Auditor. EA-5846.

ENERGY AUDIT REPORT OF KALIABOR COLLEGE, NAGAON, ASSAM

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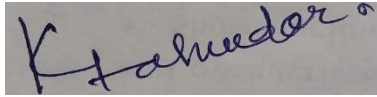
1. ACKNOWLEDGEMENT

This is to express our thanks and gratitude to the management of Kaliabor College, Kuworitol, Nagaon for giving us an opportunity to conduct an energy audit of the esteemed institution.

We are also grateful to Dr. Uttam Kumar Baruah, Principal of Kaliabor College for providing us the data relating to power supply to Kaliabor College which helped us to complete the audit.

We also thank Dr. Pradip Mochahary, Co-Ordinator, IQAC, Sri. Pratyosh Gogoi, Asst Professor, Dr. Barnali Kakati, Asst. Professor and entire team of teachers and staff for helping us in carrying out energy audit of Kaliabor College, Nagaon, Assam.

We hereby acknowledge the support of Energy Conservation Committee team in completing this report.



Khanindra Talukdar.

B.E.E. Certified Energy Auditor.

EA-5846.



IDENTITY CARD

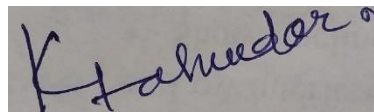
2. CERTIFICATE OF ENERGY AUDIT

This is to certify that an energy audit has been conducted at Kaliabor College at Kuwaritol, Nagaon-782137, Assam.

The audit was performed in accordance with the guidelines and standard set forth by the Bureau of Energy Efficiency.

The audit encompassed a detailed review of energy consumption patterns identifying energy consuming devices and processes. An evaluation of the efficiency of existing energy systems was conducted leading to identification of potential areas of energy savings. Based on these findings, recommendations have been proposed for improving energy efficiency and implementing energy saving technologies and practices. A final analysis was also conducted which included a cost benefit analysis of proposed energy saving measures and an estimation of potential cost savings. The findings and recommendations have been documented in the final audit report submitted to the college administration on 31st January, 2025.

Kaliabor College is commended for its commitment to energy efficiency. It is believed that implementation of the recommended measures will result in significant energy savings and contribute to goal of sustainability.



Date-31st, January, 2025.

Place- Guwahati.

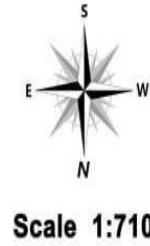
(Khanindra Talukdar)

B.E.E Certified Energy Auditor.

EA -5846.



CAMPUS LAYOUT OF KALIABOR COLLEGE



LEGENDS

1. PRINCIPAL'S RESIDENCE.
2. ADMINISTRATIVE BLOCK.
3. SECURITY ROOM.
4. CAR PARKING.
5. CYCLE STAND-I.
6. CYCLE STAND-II.
7. ARTS BLOCK.
8. CENTRAL LIBRARY & COMPUTER SCIENCE DEPT. & DEPT. OF VOCATIONAL COURSES.
9. AUDITORIUM.
10. CANTEEN.
11. PM COMMERCE BUILDING.
12. DEPT. OF PHYSICS.
13. DEPT. OF BIOLOGICAL SCIENCE.
14. ORCHID HOUSE.
15. MICROBIOLOGY LAB.
16. DEPT. OF CHEMISTRY.
17. CLASS ROOM BUILDING-I.
18. CLASS ROOM BUILDING-II.
19. GIRLS HOSTEL.
20. WARDEN'S RESIDENCE-I.
21. GENTS TOILET.
22. GIRLS TOILET.
23. CLASS ROOM BUILDING-III.
24. INDOOR STADIUM.
25. VOLLEYBALL COURTS.
26. MULTIGYM.
27. BOYS HOSTEL.
28. RESIDENCE OF WARDEN-II.
29. STUDENTS UNION ROOM & BOYS COMMON ROOM.
30. RUSA ARTS BUILDING.
31. GIRLS COMMON ROOM.
32. DRINKING WATER SUPPLY.
33. ARYA BHATTA SCIENCE CENTER.
34. HERBAL MEDICINE GARDEN.

4. ENERGY AUDIT AND ITS OBJECTIVES:

Energy Audit is a systematic inspection and analysis of energy usage to identify ways to reduce energy consumption. It can be performed at any establishment where energy is consumed.

Purpose of Energy Audit is to identify areas of energy waste, to budget energy use, plan energy conservation methods, lower operating costs and improve energy efficiency. This is an assessment of energy consumed within a time frame in a given location and to explore means to reduce consumption of energy by replacement with energy efficient devices or an efficient process in the system or both.

As per energy conservation Act,2001, Energy Audit is defined as “the verification, monitoring and analysis of use of energy including submission of technical report containing recommendation for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption.”

In the provision of the Energy Conservation Act,2001 the Bureau of Energy Efficiency has been set up under the Ministry of Power. The parliament of India passed the bill on conservation of energy bill in 2001 there by enlisting a set of rules to make efficient use of energy.

Conservation of energy needs to be adopted as a part of our habit in our daily lives.

Accredited B++ by NAAC



KALIABOR COLLEGE

(Affiliated to Gauhati University, UGC recognized)
P.O. - KUWARITOL - 782137: NAGAON: ASSAM

Email: principal@kaliaborcollege.org

Tele-Fax: 03672-295517

website: www.kaliaborcollege.org

Ref. No. *K.C.22/Misc/24/338*

December 18, 2024

To,
Khanindra Talukdar
BEE Certified Energy Auditor,
H. No. 8, 5th bye-lane, Gandhibasti,
Guwahati, Kamrup (M), Assam. PIN 781003

Subject: Request to conduct Energy Audit of Kaliabor College.

Respected sir,

With reference to the subject cited above, I am writing to formally request you to conduct an energy audit of Kaliabor College, Nagaon.

As an institution committed to sustainable development, we recognize the importance of efficient energy consumption and environmentally friendly practices. We believe that a comprehensive energy audit will provide us with valuable insights into our current energy usage patterns, identify areas for improvement and help us implement effective energy conservation measures.

We are confident that your expertise will be invaluable in conducting a thorough and insightful audit. We are ready to provide all necessary support and cooperation to facilitate a smooth and successful audit process and should you accept this request, we urge you to conduct the said audit as early as possible.

We look forward to your positive response and the opportunity to work together towards a more sustainable future.

Thank you for your time and consideration.

Dr. Uttam Kumar Baruah,
Principal, Kaliabor College
Principal
Kaliabor College
Kuwaritol - 782137
Nagaon, Assam

5. Energy Conservation Committee (ECC)

During Walk in Energy Audit at Kaliabor College, Kuworitol, Nagaon, Principal of Kaliabor College and the team of IQAC was apprised of the need to form an Energy Conservation Committee (ECC) to sustain energy conservation measures within the institution and spread the message of using energy in optimal way to delay climate change due to global warming of our planet called "the Earth".

College authority has decided to form an E.C.C. with members as follows.

1. Dr. Uttam Kumar Baruah- Principal, Kaliabor College, Team Leader.
2. Dr. Pradip Mochahary - Co-Ordinator, IQAC.
3. Dr. Basistha Kalita - Member
4. Sri. Pratyosh Gogoi- Member
5. Dr. Barnali Kakati- Member
6. Sri. Malay Ranjan Borah- Member
7. Sri. Putul Basumatary – Member (Electrician)

Objectives:

1. Make students, teachers and community around the college aware of the need to save energy by switching off lights, fans and other accessories when not needed.
2. To collect and collate data for preparation of energy audit report based on data made available by the college authorities.
3. Formation of such a team will lead to continuity of efforts to save energy and water and spread the message to all stake holders including students, teachers and people living around the institution.
4. Climate change facing our planet needs to be met with our life style to depend less on use of fossil fuel.
5. As a beginning, all the stake-holders may try to use means of transport with lesser use of fossil fuel by walking, using bicycle, electric vehicle to the extent possible.

6. Executive Summary

The Executive summary gives an overview of the conservation measures taken by management of the college. An initiative to carry out energy audit is in itself a positive step to use of energy efficiently. The steps involve action initiated to save energy on various energy consuming devices like illumination, fans, air conditioners, pumps and so on.

1. Among energy saving measures 40 w tubes are to be replaced by 20-watt LED tubes.
2. Compact Fluorescent Lamp (CFL) need replacement with 10w LED lamps.
3. There are 503 fans and each consume 75watts. These can be replaced by 30-watt BLDC fans.
4. A 40Kwp capacity solar plant is already installed. As life of batteries have exhausted the unit can be connected with grid which will start generating power for college. The excess power can be sold to APDCL within a provision of fresh agreement.

Power saving, Investment & Payback period chart:

SLno	Item to be replaced	Replaced by	Power saved/year (Kwh)	Capital invested (Rs)	Payback period
1	40-watt tube	20-watt LED	288	2692.8	11 months
2	Compact Fluorescent Lamps (CFL) 23-w	10-watt LED	538.2	5032.17	5 months
3	Ceiling fans 75-watt	BLDC fans	40743	380747	5.28 years
4	Partial Grid Power (Average Solar panels in Assam can generate 3Kwh/Kwp)	40 Kwp Solar panel already in place	43800	4,09,530	immediate
Total savings			85369.2	Rs.3,88,471.97	@ Rs.9.35/kwh (2025-26)

Some observations during walk in audit

- The authorities of the institution have implemented recommendation of last energy audit report which resulted in saving of power.
- The 40 Kwp solar panel was not functional and as a result the college had to depend on grid power supplied by APDCL.
- As solar power is a green power, it needs to be connected to grid and augment the generation of own power by college solar plant.
- It was also observed that the solar panels were shaded by trees and branches of trees need to be pruned to have adequate exposure to sun rays.
- Solar panels needed to be cleaned regularly to ensure optimum performance.
- There were a number of plug points (6 and 16 amps) in science laboratories which were rarely used and same can be removed if not needed.
- 40-watt Tube lamps, CFL used for illumination can be replaced by 20watt LED tube to economise power consumption.
- The DG set was used occasionally and there was a need to maintain a log book to record fuel consumption and other parameters.
- Water taps in toilets needed to be leak proof to prevent wastage of water.
- Air filters of air conditioners needed to be cleaned as a part of annual maintenance exercise to save power.
- Section wise MCB (miniature circuit breaker) may be used to put off electrical appliances after the classes are over.
- There could be some hoarding in prominent places in the campus to highlight about need to save power.
- The illumination level of the class rooms and toilets need to be optimized.

7. ENERGY SCENERIO OF KALIABOR COLLEGE, KUORITOL, NAGAON.

Kaliabor College is presently supplied with power from Assam Power Distribution Company Limited through a 250 Kva transformer with a connected load of 90 kw and contract demand of 78 kw as per report of APDCL dated 12th December,2024.

However, the period considered for energy audit is from July,2023 to June,2024. During this period of audit power supply to the college was by means of two service connections with total connected load of 8.16kw. It may be noted that during audit period there was no power supply from the solar power plant having a capacity of 40 Kwp with battery backup in off grid mode. As battery bank had exhausted its life solar power did not support the power supply and the college had to depend on the grid power. After the grid power with total connected load of 90 kw was installed two numbers of consumer connections were dismantled.

Entire distribution network within the college supplies power to administrative block, Academic blocks, Science laboratories and class rooms, a central library, smart class room, canteen, both Boy's and Girl's hostel, principal's quarter, Sports Complex along with multipurpose hall used as auditorium, etc.

In the event of power failure, a DG set comes to restore supply of power. When there is a grid supply the DG set remains in standby mode.

Sl No	Mode of power supply	Values
1	load with Consumer no *****5064	2.1 kw (dismantled)
2	Load with Consumer no *****5065	6 kw (dismantled)
3	Supply of power	11kv grid of APDCL
4	Capacity of Solar plant	40 Kwp
5	Rating of DG set	58 hp
6	Power supply source	250 KVA transformer
7	Connected Load	90kw
8	Contract demand	78kw

8. Methodology of Energy Audit:

The methodology for energy audit consists of preliminary audit, audit and post audit stages.

1. Building a team for Energy conservation (ECC). During preliminary audit, Energy Conservation Committee (ECC) is formed with the principal of college as the team leader. Energy Audit is a collective effort. During the discussion on energy conservation measures related to objectives, scope of works, standard operating procedures, awareness building among stake holders, roles and responsibilities of ECC team, importance of saving electricity and safety measures are highlighted. The members adopted various proactive measures to carry on energy conservation measures.

2. Walk in Audit: The team goes around the college campus to take a stock of various power consuming devices including illumination arrangement in class rooms and offices, fan, air conditioners, pumps and other electrical devices in college premise.

3. Data Collection: Auditor during walk in audit collects various data relating to number of lights of various capacities, fans, air conditioner, energy bills, agreement with utility, log book of DG set, pumps, computers and so on.

4. Analysis of Data: All data and related documents are compiled and analyzed to assess total load, effective load, consumption pattern.

5. Identification of energy consuming devices: It is a normal practice to install more electrical devices than required. Not all plug points are in use at a time. After a study of the facilities, energy consuming devices are identified and where required appropriate field measurements are collected to supplement findings.

6. Bills by utility for analysis: The electricity bills served by utility are analysed and the pattern of energy consumption is studied. Chances are there that maximum demand may vary depending on consumption of electricity recorded by maximum demand meter.

7. Evaluation and Payback. Information based on available documents, measurements where required, feasibility of conservation measures is studied with pay back method. This may be segregated to short-, medium- and long-term period.

8. Preparation of Audit report: The findings and recommendations of audit are documented in the audit report. This report suggests the changes to be made for optimum use of electrical energy leading to saving on cost of electricity consumption.

9. Post audit period: The energy conservation measures (ECM) will bring benefits of energy and costs saving only after the recommendations are implemented. The onus is on the user and stake holders of the institution to implement the ECM.

9. Scope of Works

Assessment of actual operating load and scope for optimizing load

- Load study of existing electrical load
- Review of electrical load based on need-based requirement

Study of Electricity bills from APDCL.

- Study of existing use of power and analysis.
- Assessment of Load on the basis of Load Study.

Energy saving proposal

- **Pay back method to compute energy saved**
- **Pay back method to compute investment made**
- **Payback period in which cost is recovered**

Recommendation of short term, Midterm and Long-term measures

- Existing standard of operation
- Performance of DG set in terms of specific fuel consumption
- Recommendation for optimum use of DG set
- Standard operating procedure
- Safety measures

10. LOAD STUDY OF KALIABOR COLLEGE

Load study of Kaliabor College, Kuworitol, Nagaon, Assam.													TABLE-1.
Sno	Location of Department	20w Tube	10w LED	CFL 15w	40w tube	Fans	16A plug	6A plug	1.5 Ton AC	1kw- Pump	LUX	Others	Remarks
1	Principal's office					2	7	6	2				Principal's office: 4nos,2x2 square led= 4x36w= 144w, 2nos,1x1 square LED=2x18w=36w. Total watt=180w
2	Canteen	2	14		2	8	3	4					
3	Library	18	69			29	4	58	1				
4	Room no - 107	6				8		1			150		
5	Economics Department	5				3	2						
6	Corridor with Eco Dept	4											Library with 2 street lights @20w
7	Room no- 101	4				4					185		
8	Room -102	4				4		1					
9	Room -103	2				6		1					
10	Dept of Statistics	2				2		1					
11	Room-205	6				8	1	1					
12	Dept of Commerce	20	1			2	1	2					
13	Commerce corridor	4						2					
14	Room no- 202	4				5							
15	Room no-204	2				1		1					
16	Dept of Mathematics	4				6		7					includes wall, stand fans
17	Room no -201(B)	1				2		1			90		
18	Room no -201(A)Lab	1				3		4					includes wall fan
19	Room no - 305	4				4		1			235		
20	Room no - 306	4				4		1					
21	Dept of Commerce (PG)	3				2		4					
22	Room no -307	3						1					
23	2nd Floor common corridor	4											14no1'x1'LED@18w=198w
24	Room no-301	4				1		4			161		
25	Room no-302	4				2		1					
26	Room no-303	4				4		1					
27	Aryabhata Science Centre	4				2		2					
28	Dept of Physics	3			1	18	4	34					
29	Dept of Zoology	1	2			2		2					
30	Dept of Botany	1	3			2		3					
31	Common Instrumentation Facility	3	2			2	9	3					Under Dept of Biological Sciences
32	Botany Class room	2	3				2	2					
33	B-101	3					2	4					
34	Bio Science Corridor	2						2					

35	B-103	3				2	4						
36	Bio Tech Hub	5				4	4	8					
37	Kalong Conference Hall			14		8	4	8	4				
38	B-201 Bio Class room		6			2		1					
39	Zoology and Botany Labs	17				8	4	5					
40	Dept of Chemistry	4				2	4	4					with wall fan-2 nos
41	Chemistry Lab	5		3		1	8	3					Exhaust-1
42	Class room Chemistry-1	2				1		4					wall fan-2 nos
43	Class room Chemistry-2	3				2	2	1			47		wall fan-1
44	Boys' Common Room	5	6			5		1					
45	Union room	3	6			4		1					
46	Room no -28	3				3						136	
47	Tourism & Travel Mgmt.	3				1		1					
48	Room no- 32	9				12							
49	Auditorium					30	6	5			234		33nos,2'x2'LED@36=1188w+ 11nos,1'x1'LED@18=198w= 1188+198=1386w.
50	Room no-22	6				5	4	1					
51	Room no-21	6				3		1					
52	Room no-20	7				7		3					
53	Corridor	4											
54	L-101	1				1		1					
55	L-102			1		1							
56	L-103			2									
57	L-104		1			1		3					
58	Dept of Computer Science		5			8	20	28					20 computers, 5KVA
59	Yoga Center	5				1		3					
60	Language lab	2				2	28	20					20 computers, 5KVA
61	L-110	3				2		1					
62	L-111	2		29		2		1					
63	BBA vocational Dept	4			2	3		3					
64	Corridor	4				6							
65	L-202	2		2		6							
66	L-203			12		6		3					
67	L-204					3		3					
68	Tea Lab					3	4	16			391		
69	Corridor							6					
70	Exam Control room -1	3				3		5					
71	Exam Control room -2	3				3		5					
72	Teacher's common room	5				4	2	2					
73	Room no -10	5				10		8					
74	Dept of Assamese	3				3		5					
75	Vice principal's office	2		1		3	3	9					
76	Dept of History	8				4		13			132		
77	Women Cell	1				2		1					
78	Medical Help desk	1				1		1					
79	EDP				2	2		3					
80	Dept of Education	2				6		8					

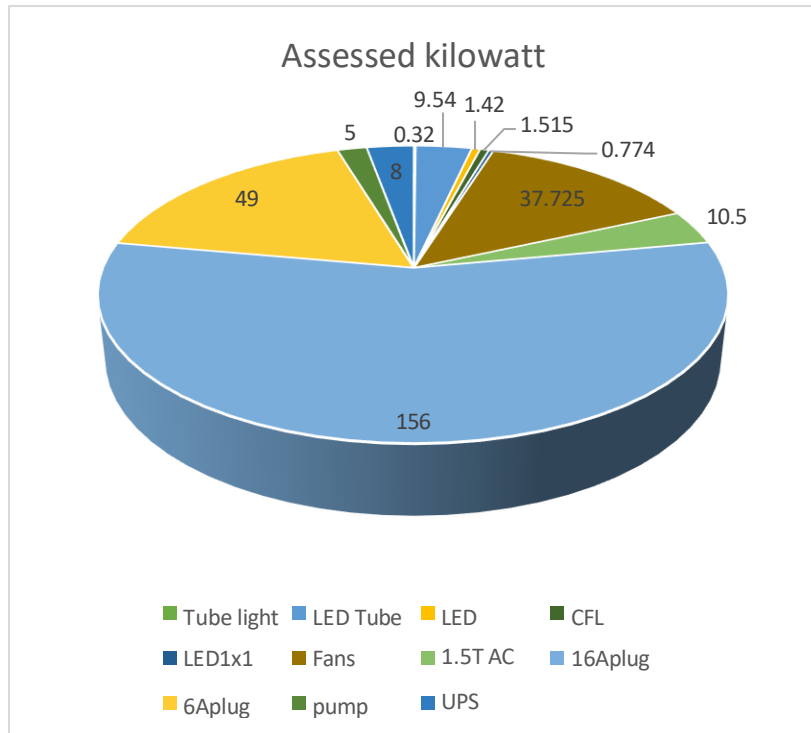
81	Education Laboratory-1	2				2		12					
82	Education Laboratory-2	2				3		12					
83	Corridor	8											
84	Dept of Political Science	1			1	4		6					
85	Dept of English	2				4							
86	Room no-6	2				2		1					
87	Room no-5	2				4		5					
88	Room no-4	2				4		4					
89	Room no-1	4				4		1					
90	Room no-2	6				4		1					
91	Rusa 101,102	13				14		4					
92	Veranda		5					1					
93	Girls common room	2				2		2					
94	Girls Hostel (28 rooms)	56				56		56					20x2 tubes,2 fans, 2 no 6A plugs each
95	Corridor	11				3	1	2					
96	Indoor Stadium											12	fins cooled lamp
97	Gymnasium	2				1							
98	Cell for local lang& culture					3							
99	Boys' Hostel (33 rooms)	33		33		33							fan-1, CFL-1,20w tube-1 each
100	Kitchen and 4 other rooms	4				2		4				1 kw pump	
101	NCC Office	4				2		6					
102	Ground Floor including accounts, adman office, IQAC cell, Distance learning and others	33	10	3		14	11	6					CFL-3
103	pumps in girls' hostel, boys' hostel, administration wing, girls' common room, commerce block.									5			1 kw each
104	Principal's Quarter	6	5			7	1	6					includes 1 exhaust fan
105	Warden-Girls Hostel	3		1		2		3					
106	Mahabahu conference hall					12	11	2					28nos 1'x1'@18= 504w
107	Alumni office		4			1	2	2					4nos1'x1'@18=72 w
	Total	477	142	101	8	503	156	490	7	5			

11. Energy Consumption of loads for 6hours/day for 25 days a month. TABLE-2

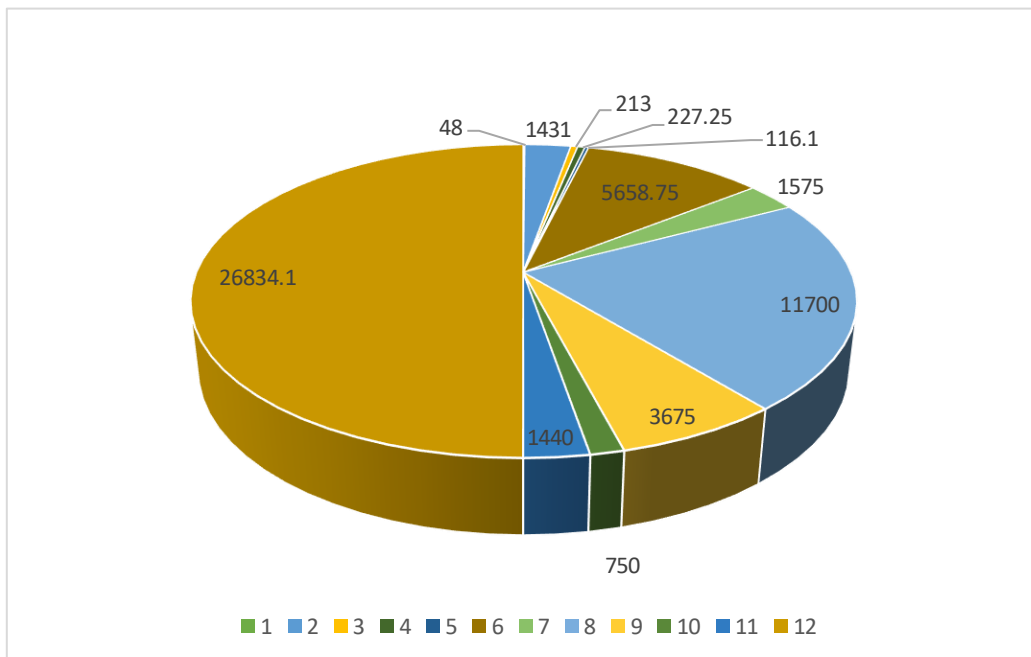
Sl no	Load	watt/unit	Quantity	Total watts	Kilowatts	Assessed kilowatt	Kwh= Kw*6*25	Remark
1	Tube light	40	8	320	0.32	0.32	48	1. Monthly Energy consumption is assessed assuming that average use of each load is 6 hrs. per day for 25 working days per month.
2	LED Tube	20	477	9540	9.54	9.54	1431	
3	LED	10	142	1420	1.42	1.42	213	
4	CFL	15	101	1515	1.515	1.515	227.25	
5	LED1x1	18	43	774	0.774	0.774	116.1	
6	Fans	75	503	37725	37.725	37.725	5658.75	
7	1.5T AC	1500	7	10500	10.5	10.5	1575	
8	16Aplug	1000	156	156000	156	156	11700	2.Total number of 16A & 6A plugs are 156 and 490 respectively. (Rows 7 & 8). Assessed load (Kw) is estimated by assuming that 50% of plugs will be used for 6 hrs. for 25 days.
9	6Aplug	100	490	49000	49	49	3675	
10	pump	1000	5	5000	5	5	750	It is presumed that devices like computers, printers, photostat m/smart boards, audio visual systems, water filers etc. will be plugged to existing plugs as per requirement.
11	UPS	1000	8	8000	8	8	1440	
12	Total Load			357825	357.825	279.794	26834.1	

Consumption device wise		
Load	Assessed kilowatt	Kwh= Kw*6*25
Tube light	0.32	48
LED Tube	9.54	1431
LED	1.42	213
CFL	1.515	227.25
LED1x1	0.774	116.1
Fans	37.725	5658.75
1.5T AC	10.5	1575
16Aplug	156	11700
6Aplug	49	3675
pump	5	750
UPS	8	1440
Total Load	279.794	26834.1

Pie Chart-1 with Assessed Kilowatt



Pie Chart-II with Kwh



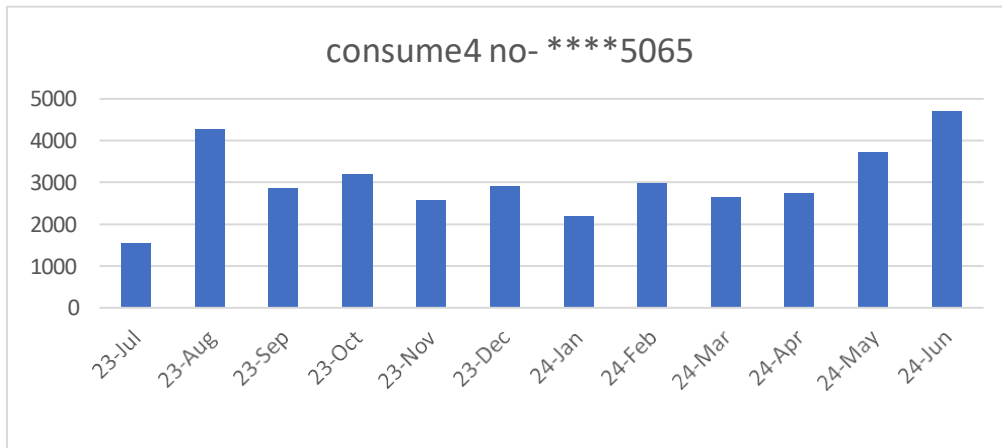
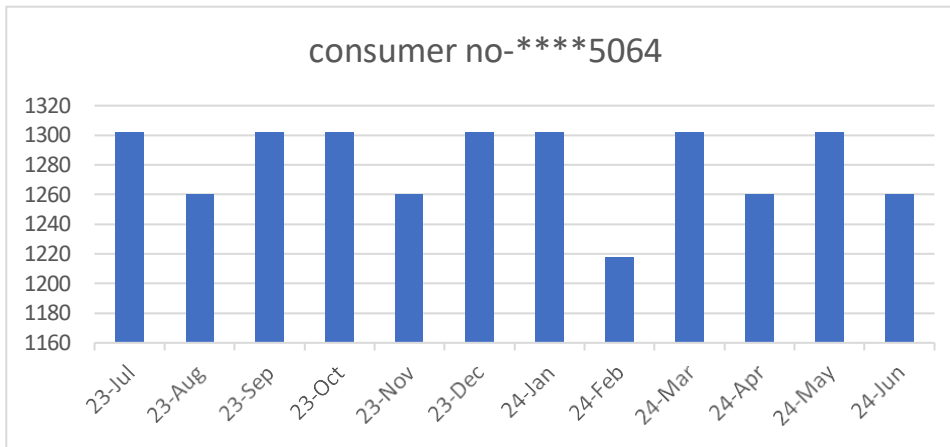
12.PAY BACK PERIOD WITH ENERGY EFFICIENT DEVICES

Payback period after replacement with 30w BLDC fans.		Table-3.	
Sl no	Particulars	Qty	unit
1	Total number of fans	503	no
2	Average power of each fan	75	watts
3	Average power of a BLDC fan	30	watts
4	Energy saved by each fan	45	watts
5	Total power saved	22635	watts
6	Power saved in Kw	22.635	Kw
7	Average hours of use of fans / year	1800	Hrs.
8	Energy saved by replacement with BLDC fans	40743	Kwh/yr
9	Avg cost per unit of energy (Tariff as per for 2025-26)	9.35	Rs
10	Cost of energy saved by replacement with BLDC fans/yr	380947.1	Rs
11	Cost of each unit of BLDC fan in Rs	4000	Rs
12	Cost of 503 nos of BLDC fans in Rs	2012000	Rs
Payback period with BLDC fans		5.281574	years

Payback period after replacement with 20 W LED tubes		Table-4.	
Sl no	Particulars	Qty	Unit
1	No of tubes	8	nos
2	watt/unit	40	watt
3	LED Tube watt/unit	20	watt
4	Energy save /unit	20	watt
5	Total watt saved	160	watt
6	Power saved in Kw	0.16	Kw
7	Avg use/year	1800	Hrs.
8	Energy saved /year	288	Kwh
9	Avg cost per unit of energy (Tariff as per 2025-26)	9.35	Rs
10	Cost saved/year	2692.8	Rs
11	Cost /20w LED	300	Rs
12	Cost of 8 LEDs	2400	Rs
Pay back		0.8912656	yrs
		11	
		months	

Pay back by replacement with 10 w LED bulbs			Table-5.	
Sl no	Particulars	Qty	Unit	
1	No of CFLs@ 23 w each	23	nos	
2	LED bulb @ 10w each	23	nos	
3	watt saved with per LED	13	w	
4	Total watt saved	299	watts	
5	Power saved in Kw	0.299	kw	
6	Avg use of LEDs Hrs./yr	1800	Hrs.	
7	total energy saved	538.2	Kwh	
8	Avg cost per unit of Energy (Tariff as per 2025-26)	9.35	Rs	
9	Cost of energy saved by 10 w LED	5032.17	Rs	
10	Cost of LED/unit	100	Rs	
11	Total cost of LED	2070	Rs	
	Pay back	0.4113534	years	
		5 months		

13.GRID POWER CONSUMPTION FOR 23-24 and SOLAR GENERATION. TABLE-6.								
Year/Month	Consumed units and power cost per month							Remark
	Consumer no-**5064	Amount in Rs	Consumer no-**5065	Amount in Rupees	KWH for both meters	Amount in Rs	Solar generation	
23-Jul	1302	10469	1557	13198	2859	23667	0	1.Table shows data of units consumed from APDCL for Audit period of July,2023 to June,2024.
23-Aug	1260	10288	4260	34393	5520	44681	0	
23-Sep	1302	21652	2847	23359	4149	45011	0	
23-Oct	1302	11237	3208	28803	4510	40040	0	
23-Nov	1260	10874	2580	22444	3840	33318	0	
23-Dec	1302	11237	2894	25623	4196	36860	0	
24-Jan	1302	11237	2177	19356	3479	30593	0	
24-Feb	1218	10512	2977	26097	4195	36609	0	2. Solar generation from 40Kwp solar panels was not functional for the same period.
24-Mar	1302	11237	2656	23495	3958	34732	0	
24-Apr	1260	10874	2735	23759	3995	34633	0	
24-May	1302	11237	3719	32481	5021	43718	0	
24-Jun	1260	10874	4704	40943	5964	51817	0	
Source: APDCL bills from July,23 to June,24.				Total	51686	455679	0	



ANALYSIS AND EVALUATION

Relevant data have been tabulated in various tables for scrutiny and analysis.

- Executive summary is tabulated in page 8.
- Load study of Kaliabor College at Kuworitol, Nagaon is tabulated on page-13-15 of Table-1.
- Table 2 shows quantities of electrical devices & power consumption on the basis of use for 6 hours per day for 25 days per month. Page-16.
- Pie charts I and II shows various components of electricity consumption in terms of devices.
- Pay back tables are in Table 3 ,4, and 5 on pages 18,19.
- Grid power and its analysis on monthly basis from July,23 to June,24 is shown graphically.
- Recommendations are shown in page 22.

14. Diesel Generator Set:

There is one Diesel Generator set of 45 Kva capacity to take care of standby power in the event of failure of power supply by APDCL. The technical specifications of the DG set are as follows:

Make	Green Power Limited
Rated HP	58
Machine Type	Four stroke IC engine
Voltage	415
Rated KW	42
Current in Amps	73
Frequency	50hz
Phase	Three phases
Cooling medium	Water cooling
RPM	1500

Performance assessment of the Diesel Generator set:

In order to assess performance of DG set it is essential to know Specific Fuel Consumption. Specific Fuel Consumption expressed in litres per hour or gram per Kwh is an indication of quantity of diesel required to generate one unit of electricity. The parameter is of direct relevance to end users as it relates to operating cost of generating electricity from DG sets. However, for that to happen we need to have a monthly fuel consumption and monthly energy generation data of 12 months.

As informed by maintenance person present DG set has been in operation for last 10 years. As such engine consumes more oil than the present generation DG set. The management could think of a replacing the present set with an efficient DG set with better fuel efficiency. It appears that the DG set was used as and when power supply to the college was disrupted. It was reported that the DG set was maintained by college authorities regularly. It was also learnt that no log book was maintained to record daily consumption of diesel oil. Further energy generation data was not available. Both log book and energy meter would be installed to have accurate data on diesel consumption.

The standard value of fuel consumption/hr. of 52 KVA DG set are as follows:

	Load %	Fuel Consumption	Unit
Fuel Consumption	At 100 % load	10	Litres per hour
	At 75 % load	8	DO
	At 50 % load	7	DO

15. Water pumping system:

There were four numbers of water pumps to cater to need of students, staff and teachers. As water is essential for our day-to-day activities the pumps, lines, valves, taps and joints need to be maintained without any leak so as to prevent wastage of water. So far drinking water is concerned it needs to be tested periodically to ensure compliance standards of drinking water in an approved laboratory.

16. Air conditioning System:

Air conditioners are energy consuming devices and need maintenance on regular basis. As the college is located in a location away from the business hub these Air Conditioners need to operate during summer season. To that extent it is appropriate to maintain air conditioners so that excess energy is not consumed.

- The filters of the air conditioners need to be cleaned on a regular basis.
- Clogged filters increase consumption of excess energy due to overloading of compressor.

17. Recommendations:

Short term measures

- i. 40-watt tubes and CFL lamps should be replaced by 20-w and 10-w LEDs respectively.
- ii. The solar plant should to be connected with grid power immediately so that power is generated. This will need no investment. A fresh agreement with APDCL has to be signed.
- iii. All solar panels of the plant need regular cleaning. The branches of trees may be pruned to allow adequate sun rays to fall on panels.
- iv. Unused plugs (6 and 16amps) should be plugged and isolated from circuit.

Midterm measures

- v. Conventional ceiling fans (75kw) may be replaced by energy efficient 30w BLDC fans in phased manner depending on use value of fans.
- vi. Filters of Air conditioners should be cleaned to reduce load on ACs.

18. Implementation of Audit recommendations:

- i. As per walk in audit most of 40 w tubes and CFL lamps have been replaced by LEDs
- ii. Measures have been initiated to clean the solar panels on regular basis to ensure optimum generation of power.
- iii. Unused plugs (6& 16 amps) are being isolated from the system as per the priority.

19. Standard operating practices:

a. Illumination:

Measurement of illumination is in Lux. i.e. lumen/m². For class rooms lux level is standardized at 300 lux. Natural light is the best and most important light to incorporate in the classrooms. Natural sun light provides physical and physiological benefits to both students and teachers. However, LED lights are best man-made lights for illumination of class rooms. Higher illumination if needed should be evaluated depending on specific needs of class rooms.

b. Air- Conditioning system:

As mentioned, air conditioners should have regular cleaning of air filter. Depending on efficiency rating by BEE it is always better to opt for air conditioners with higher star rating (4-to-5-star rating) which are energy efficient.

c. Earthing system, preventive maintenance and safety:

The term Earthing means connection of the neutral points of the supply system or non-current carrying parts of electrical apparatus, such as metallic frame work, metallic covering of cables, stay wire etc. to the general mass of earth in such a manner that at all times immediate discharge of electricity takes place without danger. Safe handling of electricity is one of the most important aspects of dealing with electricity. It needs to be underlined that all electrical devices including laboratory power points need to be earthed to avoid any short circuit which may lead to electrical accidents.

Every electrical system should be earthed to ensure safety of the equipment and safety of person handling equipment. There should be scheduled inspection of electrical networks to take up preventive maintenance and ensure safety. It is better to go for a technological upgrade of protection system by installation of Earth Leakage Circuit Breaker (ELCB) in the circuit to prevent any accident due to earth leakage.

Solar panels need to be solidly earthed to prevent any accident.

d. Awareness on Energy conservation:

The need to save energy has to be understood by all stake holders as source of generating electricity by fossil fuel has become incompatible with global warming and climate change. Awareness on need for energy conservation has to percolate to every level of society by means of hoarding in prominent places, organizing discussion and popular talks, quiz and so on.



Members of IQAC along with solar plant personals during energy audit.



**40 kW Off-Grid Solar Photovoltaic Power Plant
at
Kaliabor College, Nagaon**

Sanctioned by - Ministry of New & Renewable Energy, Govt. of India, New Delhi

Implemented by - Assam Energy Development Agency
Bigyan Bhawan, ABC, GS Road,
Guwahati-781005

Executed by - M/s Samved Energy Systems Pvt Ltd
EL-8, J Block, MIDC, Bhosari, Pimpri-Chinchwad,
Maharashtra 411026
email- samvedenergy@gmail.com , web- www.samvedenergy.com
Contact-07350003593 / 96 / 97, Service Centre- 88888 74884

**Aryabhata Science Centre
o-Club, Environment and Climate Cell**

The display board features several items:

- A poster titled "Our Land. Our Future" with the hashtag #GenerationRestoration, showing a landscape with trees and animals.
- A poster titled "We are #GenerationRestoration" with a similar landscape image.
- A notice for the "STATE MEET OF ARYABHATTA SCIENCE CENTRES" organized by the Assam Science, Technology and Environment Council. It includes details about a "STATE LEVEL ROBOTICS COMPETITION" with prize amounts of ₹20,000, ₹15,000, and ₹10,000.
- Other smaller notices and documents are pinned to the board.



Shaded panels of the solar plant.

END OF THE REPORT.