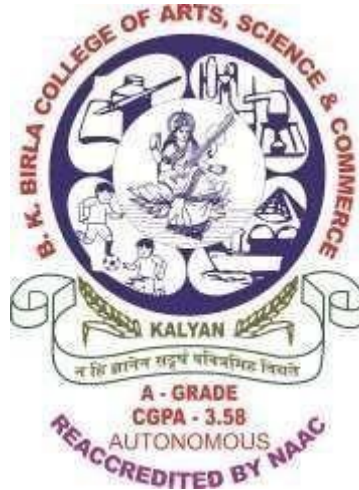


B. K. BIRLA COLLEGE OF ARTS, SCIENCE AND COMMERCE (AUTONOMOUS), KALYAN



ENERGY AUDIT REPORT

TALUKA-KALYAN, DISTRICT-THANE

Maharashtra 421304

Phone No: 0251-2230740/ 2231294

E-mail Id: principal@bkbirlacollegekalyan.com

Website: <https://www.bkbirlacollegekalyan.com/>

Conducted and submitted by



UNIQUE ASSESSMENT SYSTEM

(Registration No: 2310200317579390)

(MSME No: MH33D0096740)

Office No 9, Sonu Aai Arcade,

Near Sonu Aai Temple,

Balkum, No-1, Thane (W)-400608

Website: <http://www.uasorg.us>

E-mail: sunil@uasorg.us

Telephone: +91- 9987831773

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Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use and serves to identify all the energy streams in a facility.

The contribution of the college's team is equally important in this venture. Team of technical experts from Unique Assessment Systems is grateful to the following personnel of B. K. Birla College of Arts, Science and Commerce (Autonomous), Kalyan for their kind cooperation, furnishing required data, analysis reports and support offered during our visit.

Name	Designation
Dr. Naresh Chandra	Director (Education)
Dr. Avinash Patil	Principal
Dr. M. K. Dhaliwal	Vice Principal and Head, Department of Microbiology
Dr. B. S. Wadekar	Vice- Principal and Head, Department of Commerce
Dr. Mahadeo Yadav	Vice-Principal and Head, Department of Business Economics
Mrs. Esmita Gupta	Vice- Principal and Head, Department of Information Technology
Sqn. Ldr Nitu Thapliyal (Retd)	Manager, Admin & Security
Mr. B. D. Joshi	I/c Registrar
Dr. Sonal Tawde	Incharge, Department of Environmental Sciences
Dr. Vandana Gupta	Quality Manager, Environmental Sciences Laboratory (NABL accredited)
Dr. Meeta Bhot	Head, Department of Botany
Dr. Vilas Khairnar	Head, Department of Chemistry
Dr. Vinod Narayane	Head, Department of Zoology
Mr. Kiran Raikar	Librarian
Dr. Annika Durve	Incharge, Department of Biotechnology
Dr. Sonali Patil	Incharge, Department of Bioanalytical Sciences
Mrs. Lakshita Soni	Coordinator, IQAC
Mr. Prakash Sansare	Head, Department of Mathematics
Dr. Harish Dubey	I/c Principal, B. K. Birla Night Arts, Science & Commerce College, Kalyan
Dr. B. L. Suranje	Head, Department of Hindi
Dr. Anuradha Hastak	Head, Department of Accountancy
Dr. Suvarna Jadhav	Head, Department of History and Foundation Course
Dr. P. A. Gadhe	Head, Department of Geography
Dr. S. K. Mhaske	Head, Department of Marathi
Dr. G. M. Khobragade	Head, Department of English
Mr. Rakesh Bhoir	Head, Department of Economics
Dr. Viplov Dhone	Head, Department of Philosophy
Mr. Vinod Rajput	Incharge, Department of Computer Science
Mr. Anil Tiwari	Incharge, Department of Bachelor of Management Studies
Dr. Anand Dharmadhikari	Incharge, Department of Accounts and Finance, Banking and Insurance
Mr. Suraj Agarwala	Incharge, Department of M.Com. (E-Commerce) and M.Sc. (Finance)
Ms. Sayali Sonawane	Incharge, Department of Bachelor of Arts in Multimedia and Mass Communication



We are also thankful to the other staff members who were actively involved while taking measurements and conducting field study.

Auditors/ Members of Audit Team

Sr. No.	Name	Qualification
1	Mr. Sunil Nair M.Sc. (Physics)	ISO 9001 Lead Auditor, ISO 14001 Lead Auditor
2	Mr. Chetan Nemade M.Tech (Energy Studies), LLB	BEE Certified Energy Manager, Advance Diploma in Industrial Safety (ADIS)
3	Mr. Swapnil Gaikwad M.Tech (Energy Studies)	BEE Certified Energy Auditor, ISO 50001 Lead Auditor

LIST OF INSTRUMENTS USED

1. Single Phase Power Analyzer
2. Ultrasonic Water Flow meter
3. Distance Meter (Bosch)
4. Lux meter (Meco)
5. TDS meter
6. CO₂ meter
7. Air quality measure meter
8. Sound meter

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1. ABOUT THE COLLEGE



B. K. Birla College of Arts, Science and Commerce (Autonomous), Kalyan, a multi-faculty premier institution of higher learning, with an enrolment of 13,500+ students (9,100 students in UG, PG and Research Programmes and 4,400 in Junior College) is affiliated to the University of Mumbai (UoM). The College was established in 1972, by Kalyan Citizens' Education Society with the blessings of **Pujya Shri B. K. Birla ji and Pujya Smt. Sarala ji Birla**.

The College is spread over 20 acres of land (including B. K. Birla Public School) in the prime location of Kalyan city. The college has 72 classrooms with ICT facility, with 50% being smart classrooms and one 3D studio. The College has taken several initiatives towards green campus including the facility of ETP, STP and Rainwater Harvesting. The College has a well-equipped Central Library (Green Library) with IT infrastructure. The Chairman and Faculty members have sponsored 25 cycles to the needy students as a green initiative.

The New Building (55,000 sq. ft.) has been added to provide new Science Labs and Classrooms.

The College offers 32 UG, 33 PG courses and 09 Ph.D. programs. The College also conducts PG Diploma in Bio-nanotechnology, PG Diploma in Global Education and A-DMLT Courses.

The College has recently introduced new aged study programs like B. VOC in Cyber Security and Forensics, M.Sc. (Data Science and Big Data Analytics), M.Sc. (Finance), M.Sc. (Artificial Intelligence), M.Sc. (Food Science and Nutraceuticals) and B.M.S. in Retail Management in association with Maruti Suzuki Pvt. Ltd. from the Academic Year 2022-23.

The UGC has sanctioned a Community College for Diploma in Accounting and Taxation in 2015-16.

The College has been reaccredited (3rd Cycle) by NAAC and awarded 'A' Grade (CGPA- 3.58) in 2014. The College was granted '*College of Excellence*' status by UGC (2015-20) and ISO 9001:2015



certified. The College has been granted '*Autonomous Status*' by UGC and UoM from 2018-19.

The Environmental Sciences Laboratory has been granted accreditation by the National Accreditation Board for Testing and Calibration Laboratories (NABL) in August 2022 for wastewater analysis.

The departments of Botany, Chemistry, Microbiology, Physics and Zoology have been awarded 'Star Status' (2017-20) and the depts. of Mathematics, Information Technology and Computer Science have been selected under Star College Scheme by Department of Biotechnology (DBT) (2017-20), Govt. of India, New Delhi.

The Rashtriya Uchchatar Shiksha Abhiyan (RUSA) has sanctioned financial support of Rs. 5.00 crore to our college for 'Enhancing Quality and Excellence' under Component-8.

The College has been approved as a Potential 'Mentor Institution', by UGC under PARAMARSH scheme (2019-20).

The College has established Mpower Counselling Cell instituted by our patron respected Dr. Neerja ji Birla, Founder and Chairperson of Mpower and ABET to provide holistic mental health care solutions.

On the occasion of celebration of Golden Jubilee Year of our College and Birth Centenary Year of our Founder Pujya Shri B. K. Birla ji, the Postal Stamp was released with the College logo and photo of Pujya Shri B. K. Birla ji by the Department of Posts, Government of India at the gracious hands of Shri Bhagat Singh ji Koshiyari, Hon'ble Governor of Maharashtra and Chancellor of Universities in Maharashtra State and Padma Bhushan Smt. Rajashree ji Birla, our Chief Patron, Chairperson, Aditya Birla Centre for Community Initiatives and Rural Development (Digitally) on Thursday, 14th October, 2021 at Raj Bhavan, Mumbai.

The College in the pursuit of excellence has attained numerous awards and accolades. The College has been consistently ranked among the best colleges of India in different education surveys nationwide. Recently, the College has been Ranked No. 2 in India, 1st in Maharashtra and 1st in Mumbai in the category of 'Extraordinary Contribution to Local Community' by Education World Grand Jury India Higher Education Rankings (2023-24); Ranked No. 1 as 'Promising Future Ready - Institution' by Education World, India Higher Education Rankings 2021-22, Ranked 1st in Country as 'New Age Study Leader Programme Leader' by Education World (2022-23) and Ranked 2nd in 'Student Diversity' by Education World (2020-21).

B. K. Birla College has a vibrant work culture with a holistic approach to education. The teaching - learning process is supported by the use of ICT, interactive exercises, projects, assignments, etc. in addition to chalk and talk method. It has taken special efforts towards developing IT enabled campus and Digital Footprints and introduced several new age programs to cope up with the market trends.

The academic results have always been higher than the University results. Every year a few students figure in the University merit list.

Research is an integral part of teaching. 25 faculty members are Ph.D. Guides. Many faculty members have worked on Major and Minor Research Projects and have published many research papers and authored books. 45 Patents (29 Granted and 16 Published) have been contributed by the Faculty Members.

The college has established Career guidance and Placement cell and Entrepreneurship cell and Skill Hub to provide help, support and guidance to the students. Hon'ble Prime Minister Shri



Narendra Modi ji inaugurated B. K. Birla College - Entrepreneurship Cell and Skill Hub (RUSA) on 03.02.2019 digitally.

The performance of students is excellent in extra-curricular activities including NCC, NSS, Sports, etc. The College NCC Units have bagged the Vice Chancellor's banner 12 times out of 20 for being best NCC Unit of UoM. Our cadets participate in Republic Day Camp, Thal Sainik Camp and All India Nau Sainik Camp regularly.

The management provides financial support to the students for participating at International and National Level. The College provides Tuition fee concession to needy students in addition to scholarships / freeships by Government.

A number of students have qualified for the UPSC / MPSC, IIT- JAM, NET and SET examinations and have received INSPIRE fellowship.

The college has signed MoU with University of West Georgia and few other national and international institutes for faculty and student exchange and to promote research. We have signed MoU with Century Rayon, Shahad, Century Enka Ltd., Pune and Rajashree Polyfil Ltd., Bharuch, for strengthening academics and research.

The College has a well-equipped Central Library with IT infrastructure, 79,000+ books, 1130 audio-visual materials, 114 periodicals, 33 E-books, institutional membership of Infilbnet and Delnet. The college has been approved as a Potential 'Mentor Institution', by UGC under PARAMARSH scheme (2019-20). The college has been selected Under the Scheme 'Unnat Bharat Abhiyan 2.0' for 'Holistic development of adopted Villages' by MHRD, GoI. (2020). We stand committed for the cause of higher education.

VISION

We aspire to be a premier institution of higher education, an inspiring Nodal Centre, catering to the diverse needs of student fraternity, providing those State-of-the-Art facilities and a stimulating Teaching-Learning-Environment, to groom them into socially-responsible, excellent human resource.

MISSION

To enable students to develop as intellectually alive, socially responsible citizens ever ready for continuous personal and professional growth.

OBJECTIVES

- To unlock the multiple facets of the students and to facilitate realization of students' potential for excellence.
- To provide them with access to a comprehensive array of careers.
- To promote research culture to channelize their spirit of inquiry.
- To motivate the students for continuous personal and professional growth.
- To instill moral values to mould them into excellent human resources.
- To provide homely environment in the institution.
- To develop students into socially - responsible citizens.
- To attain still greater heights of glory and excellence.

LOCATION



2. ELECTRICITY BILL SUMMARY

B. K. Birla College of Arts, Science and Commerce (Autonomous), Kalyan has one MSEDCL HT three phase electricity connections in the college premises for all buildings.

The major electricity consumption in college building is lighting, fans, ACs as well as water pumping to various buildings during college hours. Also, Water Treatment Plant, Effluent and Sewage Treatment Plant has major electricity consumption in the college.

ELECTRICITY BILL SUMMARY

Consumer No.					020029058590			
Billing Unit					4168			
Category					LT-VII-B (Public service-Others)			
Connected load					506		kW	
Contract Demand					347		KVA	
Month	Bill Demand	Actual Demand	Units		ToD benefits	P.F	Total Bill	Average Unit Rate
	KVA	KVA	kWh	kVAh	INR		INR	INR/kWh
Jan-22	208	82	20882	21028	-1483.60	0.993	359493.05	17.10
Feb-22	208	93	22748	22831	-918.10	0.996	381845.79	16.72
Mar-22	208	178	44177	44394	2995.70	0.995	656316.80	14.78
Apr-22	226	194	46799	47040	2830.60	0.994	689156.25	14.65
May-22	226	158	41828	42036	709.90	0.995	626858.66	14.91
Jun-22	226	180	42714	42836	1232.50	0.997	717396.94	16.75
Jul-22	226	176	43369	43519	1723.00	0.996	727417.53	16.71
Aug-22	226	183	48530	48863	2013.50	0.993	801564.40	16.40
Sep-22	226	187	48908	49166	2018.20	0.994	806566.55	16.40
Oct-22	226	198	45729	46021	1078.60	0.993	761980.51	16.56
Nov-22	226	168	45273	45671	53.40	0.991	755843.23	16.55
Dec-22	226	182	50979	51528	-972.00	0.989	835481.16	16.21
Jan-23	226	144	45482	45993	-1666.00	0.988	756259.12	16.44
Feb-23	226	169	41658	41994	-1644.80	0.992	703001.18	16.74
Average			42076.86	42351.43			684227.23	16.15

OBSERVATION

1. The total monthly average energy consumption of the college is 42351 units.
2. Average unit rate of college is 16.15 INR/kWh
3. Total monthly billing is INR 6,84,227 /-
4. The college has started taking ToD (Time of Day) benefits in the electricity bill from December 2022, by operating electrical load of water pumping during night duration i.e. from night 10:00 pm to morning 06:00 am.
5. 160 kWp Solar PV system with net meter is installed on the main college building rooftop as a renewable energy source.
6. 36 kWp Solar PV system with net meter is installed on IT building rooftop as a renewable energy source.
7. 1 kWp Solar PV system with battery backup is installed on library building rooftop as a renewable energy source.
8. 3 kWp Solar PV system with battery backup is installed on canteen building rooftop as a renewable energy source.
9. Due to net meter system of Solar PV, impact of export- import of energy consumption and generation shows in the electricity bill.
10. Bio-gas plant is installed near canteen for cooking purpose.
11. Also, Solar PV system streetlamps with battery backup are installed in college campus.

Page 4
Consumer No. : 020029058590

Export / Generation Meter Readings						
Meter Type	Current Reading		MF	Consumption	SLOTWISE UNITS	
	Previous Reading			Adjustment	Slot 1	Slot 3
Meter Serial Number	Difference			Total Consumption	Slot 2	Slot 4
TOD EXPORT METER	28/02/23	303.95	4.00	667.00		
	20/02/23	137.16		0.00	0.00	260.00
600-22010199	166.79				667	408.00
TOD SOLAR GENERATION METER	28/02/23	2796.80	3.00	7512.00		
	20/02/23	292.80		0.00	0.00	2540.00
076-04020500	2504.00				7512	4952.00

Replaced Main Meter Readings						
Meter Type	Current Reading		MF	Consumption	SLOTWISE UNITS	
	Previous Reading			Adjustment	Slot 1	Slot 3
Meter Serial Number	Difference			Total Consumption	Slot 2	Slot 4
TOD-MAIN METER 3 CNT	20/02/23	181882.20	4.00	33734.00		
	31/01/23	173448.75		3.00	6383.00	6614.00
065-04579157	Units in KWH	8433.45		33737	16952.00	3789.00

3. ENERGY PERFORMANCE ASSESSMENT OF LIGHTING

3.1 COLLEGE CAMPUS- OLD LIGHTING REPLACEMENT

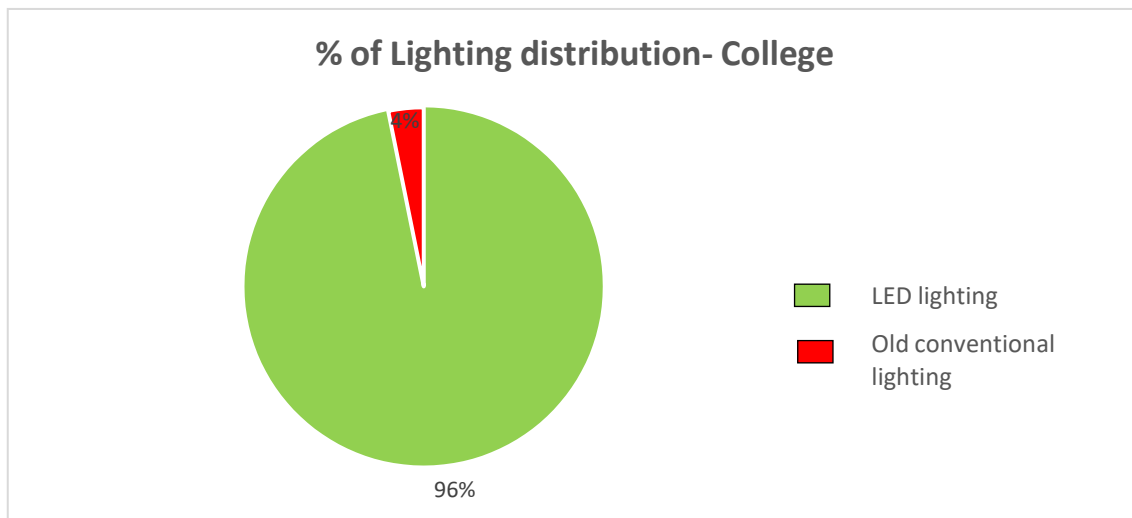
Summary of Electrical Point Location Wise

OBSERVATION

Summary of Electrical Point Location Wise

Location	Light						Round light 20W	Fan	AC	Exhaust Fan
	9 W	18 W	15 W	28 W (non LED)	36W (non LED)	70 W				
Main Bldg Gr. Flr		231	35	19	4			125	18	19
Main Bldg 1st . Flr	8	264	24	20				125	9	2
I T Bldg Gr. Floor	7	139					14	54	26	1
I T Bldg 1st Floor	11	182			15		14	94	37	3
I T Bldg 2nd Floor	6	142					18	62	7	2
I T Building – Third Floor	2	127					11	43	7	
I T Building – Fourth Floor	3	99					11	34	3	
NCC Store					8			3		
Badminton Hall		10				4			1	1
Canteen				25				17		
Gymkhana					20			8	2	2
Library	5	130						46	3	3
New Building Grnd Floor	3	262					29	89		20
New Building 1st Floor		460					29	103	9	22
New Building 2nd Floor		217					26	52		11
New Building 3rd Floor		216					26	52		11
Grand Total	45	2479	59	64	47	4	178	907	122	97

Total light Load			
Type	Quantity	kW load	% of load
LED lighting	2765	49.77	96.14
Old conventional lighting	111	4.00	3.86
Total	2876	53.77	100



ENERGY SAVING MEASURES AND RECOMMENDATION

It is recommended to replace the old lighting with new energy efficient lightings.

Total lighting savings- Replacement of old lighting		
Monthly consumption	696.80	kWh/month
New monthly consumption	399.60	kWh/month
New monthly saving kWh	297.2	kWh/month
New monthly saving INR	4799.78	INR/month
Total Investment	18200	INR
Payback period	3.79	months

3.2 COLLEGE CAMPUS- 50% STREET LIGHTS WITH MOTION SENSOR

OBSERVATION

1. The college has installed new energy efficient LED lighting (97%) in the college campus for streetlights.
2. The battery backup for Solar PV panel streetlights is also installed.
3. Streetlights are on for 10-12 hours during the night time

Phase out existing battery backup solar street lights



Streetlights in the Campus							
Location	100	75	65	27	15	12	Total
	watt	watt	watt	watt	watt	watt	watts
I T Building pole light	38						
Wall fitted		8					
Wall fitted main Building			6				
Garden pole light				24			
Solar panel light					14		
Solar pole light						14	
Main Building lawn surrounding light	13						
Total watt	5.1	0.6	0.39	0.65	0.21	0.17	7.12

ENERGY SAVING MEASURES AND RECOMMENDATION

1. It is recommended to install motion sensors for 50% streetlights to save additional energy consumption.
2. Phase out battery backup streetlights with conventional LED streetlights, as the college has already installed Solar PV system with net meter. This will avoid unnecessary maintenance on battery and its cost.

Total lighting savings- 50% Street light with motion sensor		
Monthly consumption	2561.76	kWh/month
New monthly consumption	1280.88	kWh/month
New monthly saving kWh	1280.88	kWh/month
New monthly saving INR	20686.21	INR/month
Total Investment	100000	INR
Payback period	4.83	months

4. ENERGY PERFORMANCE ASSESSMENT OF FAN

4.1 COLLEGE CAMPUS AND ALL BUILDINGS

OBSERVATION

1. The college has installed old conventional induction motor fans (911 nos.) which consume 65W at fullspeed.
2. College has taken initiative to install new BLDC motor fan which consumes 28W at full speed.

Summary of Electrical Point Location Wise	
Location	FANs
	65 Locations
	Nos.
Main Building Ground Floor	125
Main Building 1st Floor	125
I T Building Ground Floor	54
I T Building 1st Floor	98
I T Building 2nd Floor	62
I T Building 3rd Floor	43
I T Building 4 th Floor	34
NR Ground Floor	36
NR 1st Floor	51
NR Extension Ground Floor	53
NR Extension 1st Floor	52
NR Extension 2nd Floor	52
NR Extension 3rd Floor	52
Arts Circle Gymkhana	3
Badminton Hall	-
Canteen	17
Gymkhana	8
Library	46
Total Nos	911
Total watts	59215
Total Kilowatts	59.215

ENERGY SAVING MEASURES AND RECOMMENDATION

1. It is recommended to replace old fans with new energy efficient BLDC (Brush Less Direct Current) fans which consumes 28W.

Total fan savings		
Monthly consumption	11843	kWh/month
New monthly consumption kWh	5101.6	kWh/month
New monthly saving kWh	6741.4	kWh/month
New monthly saving INR	108873.61	INR/month
Total Investment	3188500	INR
Payback period	29.29	months

5. ENERGY PERFORMANCE ASSESSMENT OF WATER PUMPING

OBSERVATION

1. There are a number of water pumps operated in the college for gardening, drinking water, domestic purposes etc.
2. The IT building underground pump, Library underground pump, and bore well pumps of IT Building and Library are working for maximum hours daily.
3. Level sensors are installed for water pumps except bore well pumps in the college.
4. Water meters are installed for KDMC water for water consumption measurements.
5. No water meters for bore well water are installed for measurement of water consumption.

No water meters installed for bore well water**Water meter installed for KDMC water**

Water pumps	Rated power					consumption	Hours
	1.5 HP	2 HP	3 HP	5 HP	7.5 HP		
WTP- 1	1					8.532	15min/day
WTP- 2			1			17.065	15min/day
IT building underground pump					1	682.59	4hrs/day
Library underground pump	1					22.753	40min/day
Bore well pump IT Building			1			204.777	3hrs/day
Bore well pump Library				1		341.295	3hrs/day
Treated water transfer pump				1		338.55	3hrs/day
Filter feed pump				1		225.7	2hrs/day
Sewage transfer pump		1				789.95	7.30hrs/day
Total energy consumption of all pumps per month						2631.212	kwh/month

SAVINGS MEASURES AND RECOMMENDATION

1. It is recommended to replace the old water pumps with new energy efficient water pumps like Shakti, Grundfos pumps etc. to save energy up to 30%.
2. Pumps in sewage treatment plant are designed as per capacity/load so it is not recommended to replace the STP pumps.

Total water pump savings due new energy efficient pumps excluding STP pumps		
Total monthly consumption	1277	kWh/month
New monthly consumption	957.75	kWh/month
Total saving kWh	319.25	kWh/month
Total saving in INR	5155.89	INR/month
Total Investment	180000	INR/month
Payback period	35	months
Average CO2 emission reduction	3.26	tonnes of CO2e/ year

6. SAVING IN AIR CONDITIONING UNITS

OBSERVATION

1. It is observed that the college has installed energy efficient BEE (Bureau of Energy Efficiency) star rating AC's in the college rooms, labs, offices etc.
2. Temperature setting was observed during audit at 25 deg C at many places. However, at a few locations, the temperature of AC was below 25 deg C.

Air conditioning units in the college



Details of Air Conditioners

Sr.no	Department / Classroom		1 TR	1.5 TR	2 TR	Average Working Hours hrs	Average energy consumption kWh/month
			TR	TR	TR		
1	Chairman Office	Onida 1.5 ton		2		3	529.5
2	Director sir Office	Onida 2 ton			1	3	264.75
3	Principal office	Onida 2 ton			1	3	264.75
4	Vice Principal Arts (Arts Faculty)	Onida 1 ton	1			3	264.75
5	Vice Principal Unaided (I.T. 2 nd Floor)	Onida 1 ton	1			3	264.75
6	Vice Principal Commerce (Examroom)	Onida 1 ton	1			3	264.75
7	PA Office	Onida 1 ton	1			3	264.75
8	Conference Room	LG 1.5 ton		1		3	264.75
9	Chemistry lab	Onida window 1.5 ton		1		3	264.75
10	Chemistry Staff Room	Onida window 1.5 ton		1		3	264.75
11	Bifocal	Onida 2 ton			2	3	529.5
12	Physics lab	Gen. 2 ton			1	3	264.75
13	Physics Dark room	Gen. 2 ton			1	3	264.75
14	Store	Gen 2 ton			1	3	264.75
15	3 D Lab	1.5 Ton		1		3	264.75
16	3 D Lab	1.5 Ton		1		3	264.75
17	English Lab 101	Onida 1.5 ton		1		3	264.75
18	Staff room 106	Onida 1.5 ton		1		3	264.75
19	Staff room 106	Onida 2 ton			1	3	264.75
20	Nanotechnology Lab 111	Voltas 1.5 ton		1		3	264.75



21	Exam Room Cabin 112	Onida 2 ton			1	3	264.75
22	Exam Room Cabin 112	Onida 2ton			1	3	264.75
23	Vice Principal Office Jr. 125	Onida	1			3	264.75
24	Botany HOD	Onida1.5		1		3	264.75
25	Zoology	Onida1.5		1		3	264.75
26	B.Sc. Biotechnology	Onida1.5		1		3	264.75
27	B.Sc. Biotechnology	Onida1 ton	1			3	264.75
28	Microbiology A C 1	Gen. 2 ton			1	3	264.75
29	Microbiology A C 2	Gen. 2 ton			1	3	264.75
30	Microbiology A C 3	Gen. 2 ton			1	3	264.75
31	Microbiology Cabin	Window Master Price	1			3	264.75
32	NR 1	Onida 2 ton			1	3	264.75
33	Gym 1	Onida 2 ton			1	3	264.75
34	Gym 2	Onida 2 ton			1	3	264.75
35	Gym 3	Onida 2 ton			1	3	264.75
36	Room No 007, IT Building	Onida 1.5 ton		1		3	264.75
37	IT General Office	Onida 1.5 ton		1		3	264.75
38	Registrar Office	Onida 1.5 ton		1		3	264.75
39	Head Clerk	Gen. 1 ton	1			3	264.75
40	Server room 1	Onida 1.5 ton		1		3	264.75
41	Server room 2	Onida 1.5 ton		1		3	264.75
42	Account Office	Onida 2 ton			1	3	264.75
43	Cash Counter	Onida 1.5 ton		1		3	264.75
44	General Office	Onida 2 ton			1	3	264.75



45	General Office	Onida 2 ton			1	3	264.75
46	H R Office	Gen. 1 ton	1			3	264.75
47	Commercial Head Office	Gen. 1 ton	1			3	264.75
48	MBA (YCMOU)	Onida 1.5 ton		1		3	264.75
49	Accounts Officer Cabin 1	Onida 1.5 ton		1		3	264.75
50	Accounts Officer Cabin 2	Onida 1.5 ton		1		3	264.75
51	IT Officer Cabin	Onida 1.5 ton		1		3	264.75
52	Purchase Office	Onida 1.5 ton		1		3	264.75
53	Laboratory 104 A	Onida 1.5 ton		1		3	264.75
54	Laboratory 104 B	LG 1.5 ton		1		3	264.75
55	Laboratory 104 A/B	LG 1.5 ton		1		3	264.75
56	Room No-004	Onida 1 ton	1			3	264.75
57	M.Sc. IT Laboratory	Onida 1.5 ton		1		3	264.75
58	New Seminar Hall	Gen. 2 ton			1	3	264.75
59	New Seminar Hall	Gen. 2 ton			1	3	264.75
60	New Seminar Hall	Gen. 2 ton			1	3	264.75
61	New Seminar Hall	Gen. 2 ton			1	3	264.75
62	New Seminar Hall	Onida 1 ton	1			3	264.75
63	Placement cell	1.5 ton		1		3	264.75
64	New Bifocal lab	Gen.2 ton			2	3	529.5
65	New M.Sc. Finance 212	Onida 1.5 ton		1		3	264.75
66	M.Com E-Comm. 213	Onida 1.5 ton		1		3	264.75
67	BMM Lab	Onida 1.5 ton		1		3	264.75



68	New Classroom 211	Onida 02 ton			1	3	264.75
69	New Classroom 211	Onida 02 ton			1	3	264.75
70	PTC Lab 302 IT Bldg.	Onida 1.5 ton		1		3	264.75
71	PTC Lab 302 IT Bldg.	Onida 1.5 ton		1		3	264.75
72	Vice Principal (Staff Room)	1 ton	1			3	264.75
73	PTC Lab 302	Onida 1.5 ton		1		3	264.75
74	Molecular Biology Laboratory	Onida 1 ton	1			3	264.75
75	Instrument Room 4th Floor	Onida 1.5 ton		1		3	264.75
76	Instrument Room 3rd Floor	LG Window 1.5 ton		1		3	264.75
77	Bioinformatics Laboratory	Onida 1.5 ton		1		3	264.75
78	NABL Laboratory	LG Window 1.5 ton		1		3	264.75
79	Library Ground Floor Office	Gen. 1 ton	1			3	264.75
80	Library Ground Floor Computer	L G 2 ton			2	3	529.5
81	IQAC	Onida 1.5 ton		1		3	264.75
82	1 st Floor Library	Onida 1.5 ton		1		3	264.75
83	Nanotechnology Laboratory 111	Onida 1.5 ton		1		3	264.75
84	Staff Room DMS-006	Onida 1.5 ton		2		3	529.5
85	IT / CS staff Room	Onida 1.5 ton		2		3	529.5
86	Gym Office	Onida 2 ton			1	3	264.75
87	Botany Instrument Room	Onida 1.5 ton		1		3	264.75
88	VMS Cabin	Onida 1.5 ton		1		3	264.75
89	Animation lab	Onida 2 ton			2	3	529.5



90	Night College Principal	Onida 2 ton			1	3	264.75
91	Administration Supervisor Cabin	Onida 1.5 ton		1		3	264.75
92	Medical Room	Onida 2 ton			1	3	264.75
93	NABL Lab IT 3rd floor	Onida 1.5 ton		1		3	264.75
94	MPower	Blue star 1.5 ton	4		1	3	1059
95	NR Extension 2 nd floor HOD Microbiology	Onida 1.5 ton		1		3	264.75
96	IT Bldg. 2 nd Partition cabin	Onida 1 Ton	4			3	1059
97	New N R Extension 1 st floor				1	3	264.75
98	New N R Extension 2 nd floor				1	3	264.75
99	New N R Extension 3 rd floor				1	3	264.75
100	M.Sc. CS Lab IT Bldg. 1st floor	Onida 1.5 ton			2	3	529.5
101	Sports Management	Onida 2 ton			7	3	1853.25
	Grand Total		23	51	48		32035.25

SAVINGS MEASURES AND RECOMMENDATION

1. It is recommended to lock the temperature settings of AC at 25 deg C to optimize energy consumption.
2. The use of an Air Conditioner (AC) becomes essential, particularly in a hot and humid climate, to provide a comfortable environment for human activities. Hence, 25 deg C is sufficient for ACs.
3. It is recommended to install temperature sensors to the ACs to optimize additional energy consumptions of ACs.

Energy savings in AC		
Total monthly consumption	32035.5	kWh/month
New monthly consumption	27163.80	kWh/month
Total saving kWh	3018.20	kWh/month
Total saving in INR	48743.93	INR/month
Total Investment	1340000	INR/month
Payback period	27	months

7. SAVINGS IN EFFLUENT TREATMENT PLANT AND SEWAGE TREATMENT PLANT

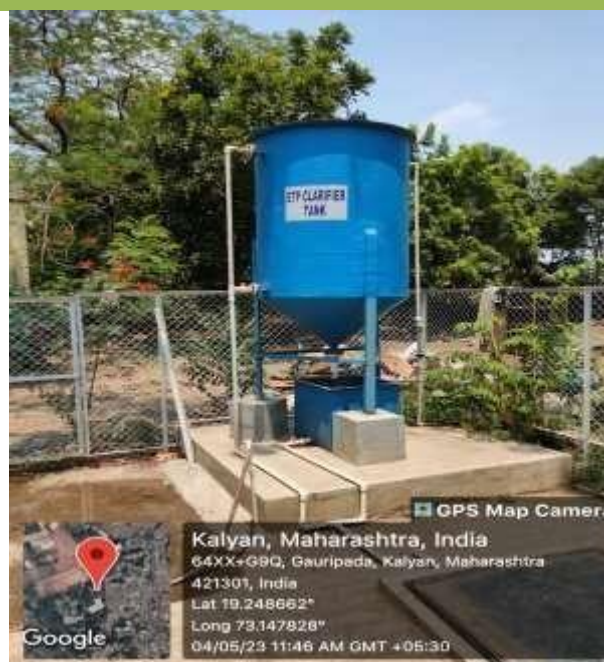
OBSERVATION

1. In college premises there are number of buildings where water is used for drinking, washrooms, laboratories, cleaning, canteen etc.
2. Wastewater is generated in college from canteen, toilets blocks, etc.
3. Wastewater generated in the college is treated in Sewage Treatment Plant which has a capacity of 300 KLPD.
4. Laboratory wastewater is treated in the Effluent Treatment Plant which has a capacity of 20 KLPD.
5. Regular testing of treated water is done by Environmental Sciences Laboratory which is NABL Accredited. It also saves lot of water due to recycling of wastewater daily.
6. Treated water from sewage treatment plant is used for gardening and flushing.
7. The capacity load on sewage treatment plant during daytime or college hours is at its peak, but after college hours, load on sewage treatment plant reduces.
8. During two months of vacation, load on sewage treatment plant is less but sewage treatment plant operates at that load.
9. Air blower of sewage treatment plant is 7.5 HP capacity operated 24 hours/day.

Sewage Treatment Plant



Effluent Treatment Plant



Sewage Treatment Plant



SAVING MEASURES AND RECOMMENDATION

1. It is recommended to install the Variable Frequency Drive (VFD) for air blower which can be operated 24 hours daily.
2. The operator of sewage treatment plant needs to be trained to optimize the energy consumption of sewage treatment plant during night time and college vacation periods.

Energy savings in Air blower of sewage treatment plant		
Total monthly consumption of Air blower	4095.54	kWh/month
New monthly consumption	2866.88	kWh/month
Total saving kWh	1228.66	kWh/month
Total saving in INR	19842.89	INR/month
Total Investment	250000	INR/month
Payback period	13	months

8. SAVING DUE TO PHASE OUT OF BATTERY BACK UP SOLAR PV SYSTEM

OBSERVATION

1. 1 kWp Solar PV system with battery backup is installed on library building rooftop as a renewable energy source.
2. 3 kWp Solar PV system with battery backup is installed on canteen building rooftop as a renewable energy source.

Phase out existing battery backup for solar street lights



SAVINGS MEASURES AND RECOMMENDATION

1. It is recommended to phase out the existing battery backup for solar PV system on library and canteen building rooftop.
2. It saves the maintenance cost and frequent battery replacement cost.

Energy savings due to phase out of battery backup solar PV system		
Solar Capacity at canteen	3	kWp
Solar Capacity at library	1	kWp
Total number of batteries (canteen and library)	6.00	nos
Cost of batteries replaced every 3-4 years	132000	INR
Total energy generation of both system	6000	kWh/year
Total saving due to both systems without maintenance	96900	INR/year
Total saving due to both systems without maintenance after 4 years	387600	INR/year
Net saving due to phase out of battery backup solar PV system	255600	INR

9. RENEWABLE ENERGY SYSTEMS

9.1 SOLAR PHOTOVOLTAIC SYSTEM- ELECTRICAL ENERGY GENERATION



INTRODUCTION

Maharashtra Government has new solar energy policy name as 'Rooftop Solar with Net Meter system'. Maharashtra government encourages to install rooftop solar PV system with net meters at available roof top of consumers. This helps to reduce the burden on existing conventional fuel fired power plants in the country.

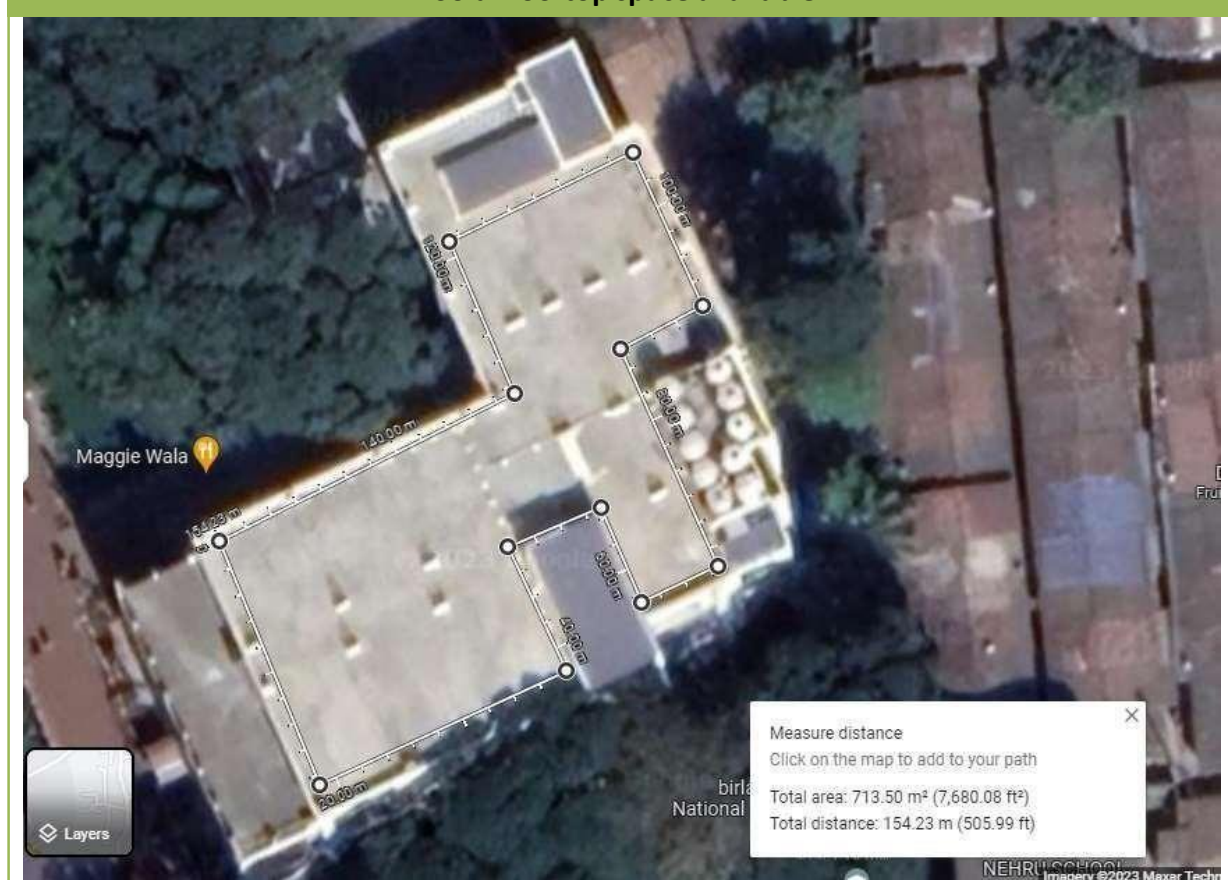
'Solar Rooftop Net meter system' helps consumers to reduce the electricity consumption in the electricity bill due to net meter.



OBSERVATION

1. 160 kWp Solar PV system with net meter is installed on main college building rooftop as a renewable energy source.
2. 36 kWp Solar PV system with net meter is installed on IT building rooftop as a renewable energy source.
3. 1 kWp Solar PV system with battery backup is installed on library building rooftop as a renewable energy source.
4. 3 kWp Solar PV system with battery backup is installed on canteen building rooftop as a renewable energy source.
5. The new NR building of college has abundant rooftop space available for solar PV system.

Solar rooftop space available



Solar rooftop space available



SAVINGS MEASURES AND RECOMMENDATION

1. It is recommended that the college should install an additional 70 kWp Solar Photovoltaic(PV) system on the available rooftop for solar energy generation in future.



SAVINGS DUE TO ADDITIONAL SOLAR PV SYSTEM INSTALLATION

Savings due to additional Solar PV system		
Total Rooftop space available- approximate	7680	Sq. foot
Total capacity of Solar PV system can be installed	70	kWp
Total solar unit generation	8727	kWh/month
Average electricity unit rate	16.15	INR/kWh
Total cost of Solar PV system	3141818	INR
Total saving	140945.5	INR/month
Payback period	22.29	months
Payback period	1.86	year
CO ₂ emission reduction/year	89.02	tonnes of CO ₂ e

9.2

ENERGY CONSERVATION BY SAVING OF WATER

TAP WATER REDUCER

Conventional Tap water system	Tap water system with Reducer
 <p>Existing tap water system uses more water for washing of utensils, hands etc. in college.</p>	 <p>Install reducer to tap water for purpose of washing of utensils, hands etc. which reduces flow of water and ultimately saves water.</p>
❌	✅

RECOMMENDATION

It is recommended to use water reducer for water taps to save water and energy consumption of water pump to lift excess water.

10. ANNEXURE

ENERGY EFFICIENT FANS

	
	28 watts
	18 watts or 8 watts as per size and load

ENERGY EFFICIENT LIGHTING

LED Lightings		
	<p>18 watts, 9 watts, 5 watts</p> <p>Companies:</p> <ol style="list-style-type: none"> 1. Wipro 2. Osram 3. Syska 4. Philips <p>etc</p>	
		
	<p>Motion sensor bulbs</p>	

11. EXECUTIVE SUMMARY

Sr. no	Location	Area	Proposed Action	Expected Result	Saving Potential per month	Monetary Saving per month	Investment	Simple Payback Period
				monthly	kWh	INR	INR	months
1	College building	Lighting	Replace existing old conventional lighting with new energy efficient LED lightings	Existing lighting consumption= 696.80 kWh	297.2	4799.78	18200	3.79
				Expected energy consumption= 348.40 kWh				
2	College campus	Street Lighting	Install motions sensors for 50% of street lightings and phase out battery backup streetlights	Existing lighting consumption= 2561.76 kWh	1280.88	20686.21	1,00,000	4.83
				Expected energy consumption= 1280.88 kWh				
3	College buildings	Fan	Replace existing old conventional fans which consumes 65W with new energy efficient (BLDC) fans which consumes 28W	Existing fan consumption= 11843 kWh	6741.4	108873.61	3188500	29.29
				Expected energy consumption= 5101.6 kWh				
4	College	Water pumps	Replace existing old water pumps with new SS energy efficient water pumps	Existing water pump consumption= 1277 kWh	319.25	5155.89	1,80,000	35
				Expected energy consumption= 957.75 kWh				



5	College buildings	Air conditioning units	Lock the temperature setting of AC on 25 deg C and install temperature sensorsfor AC	Existing AC energy consumption= 30182 kWh	3018.20	48743.93	13,40,000	27
				Expected energy consumption= 27163.80 kWh				
6	College campus	Air blower of Sewage Treatment Plant	Install the Variable Frequency Drive (VFD) for air blower of sewage treatment plant	Existing air blower Consumption = 4095.54 kWh	1228.66	19842.89	2,50,000	13
				Expected energy consumption = 2866.88 kWh				
7	College canteen and library	Battery backup Solar PV system	Phase out battery backup solar PV Caps system is connected to net meter	Average monetary saving	₹ 2,55,600			
8	College NR building	Additional Solar PV system with net meter	In future install additional solar PV caps system with net meter of capacity 70 kWp	Average monetary saving	8727	140945	3141818	22.29



DECLARATION

I agree with all the observations dated: 27/05/2023 and recommendations mentioned in this report.

Unique Assessment System



DECLARATION

I agree with all the observations dated: 27/05/2023 and recommendations mentioned in this report.



Unique Assessment System