



GREEN AUDIT REPORT

ST.BERCHMANS COLLEGE CHANGANASSERY

Executed by



2023



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GREEN AUDIT REPORT
ST. BERCHMANS COLLEGE
CHANGANASSERY





Green Audit Report
St. Berchmans College, Changanassery
Report No: EA 988
2023

About OTTOTRACTIONS

OTTOTRACTIONS established in 2005, is an organization with proven track record and knowledge in the field of energy, engineering, and environmental services. They are the first Accredited Energy Auditor from Kerala for conducting Mandatory Energy Audits in Designated Consumers as per Energy Conservation Act-2001. Government of Kerala recognized and appreciated OTTOTRACTIONS by presenting its prestigious “The Kerala State Energy Conservation Award 2009” for the best performance as an Energy Auditor. Ottotractions is an ISO 9001-2015 and ISO 14001-2015 Certified organization, which ensures the quality of its services.

Acknowledgment

We were privileged to work together with the administration and staff of St. Berchmans College, Changanassery for their timely help extended to complete the audit and bringing out this report.

With gratitude, we acknowledge the diligent effort and commitments of all those who have helped to bring out this report.

We also take this opportunity to thank the bona-fide efforts of audit team for unstinted support in carrying out this audit.

We thank our consultants, engineers and backup staff for their dedication to bring this report.

Thank you.

B V Suresh Babu
Accredited Energy Auditor
AEA 33, Bureau of Energy Efficiency
Government of India

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Preface

Educational institutions always had an important leadership role in society in demonstrating types of changes that used to occur with respect to the prime issues of the time. All around the world, educational institutions are taking steps to declare themselves the next carbon neutral school as a part of the global trend of becoming sustainable. In 2007, Victoria University School of Architecture and Design declared themselves the first carbon neutral campus in the world through the purchase of carbon credits. This concept is not a sustainable model as it does not guarantee the capture of carbon forever and also it is expensive.

The potential for any academic institution- (may be a school in a remote village or a university in an urban setting) - to become the driver for change is huge. Its role of practicing leadership in its community can be utilized to encourage and influence carbon neutral living.

The biggest factors that contribute towards emission are Energy, Transportation and Waste. Any reduction in the carbon emission by the above sectors, starts with the behavioral changes (Low cost) and/or technological investments (High cost). In order to make these changes, the students are to be educated properly on the concept of carbon neutral campuses and methods to reduce it.

In India, the concept of carbon neutral campuses is gaining momentum. Green Audit in Campuses measures the amount of Green House Gases (GHG) emissions produced as a result of its operations through an accounting like inventory of all the sources of GHGs and carbon sequestration in the school campus. Based on this, the total carbon footprint is estimated. Measures are recommended to bring down the carbon footprint of the campus and to make it a carbon neutral campus.

B. Zachariah

Director, OTTOTRACTIONS

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Introduction



Background

All across the developed countries, educational institutions are now moving to a sustainable future by becoming carbon neutral and greener spaces. They are taking responsibility for their environmental impact and are working to neutralize those effects. To become carbon neutral, institutions are working to reduce their emissions of greenhouse gases, cut their use of energy, use energy efficient equipment, use more renewable energy, plant and protect green cover and emphasize the importance of sustainable energy sources. Institutions that have committed to becoming carbon neutral have recognized the threat of global warming and are therefore committing to reverse the trend. Studies on this line has not struck roots in most of the developing countries-especially among students.

The Sustainable Development Goals (SDGs), launched by the United Nations in 2015, are an excellent vehicle for driving this change. They represent an action plan for the planet and society to thrive by 2030. The SDGs provide a window of opportunity for creating multidimensional operational approaches for climate change adaptation. They address poverty, hunger and climate change, among other issues central to human progress and sustainable development, such as gender equality, clean water and sanitation, and responsible consumption and production.



SUSTAINABLE DEVELOPMENT GOALS



The Green Audit of college aims to assist campus to reduce their carbon footprint and educate tomorrow's leaders about strategies for carbon mitigation using their campus as a model. Also, this audit covers institutes responses towards SDGs by covering SDG 3,6,7,11,13,15. The green audit also aims to educate students and teachers on the concept of carbon footprint and to enable the students to collect data pertaining to the carbon emissions and carbon sequestration in their campus and to calculate the specific carbon footprint of the campus.

The project also suggests plans to make the campus carbon neutral or even carbon negative by implementing carbon mitigation strategies in areas such as,

- a. Energy
- b. Transportation
- c. Waste minimisation
- d. Carbon Sequestration etc.

The major objectives of the audit are:

- To make aware students and teachers on the concept of carbon footprint.
- To calculate the specific carbon footprint of the campus and classify it as carbon negative, neutral or positive.
- To create carbon mitigation plans to reduce their footprint based on the data generated.

ST. BERCHMANS COLLEGE, CHANGANASSERY

St Berchmans College is the first higher education institution of the Archdiocese of Changanacherry. This institution was founded in 1922 by Venerable Mar Thomas Kurialacherry, Bishop of Changanassery diocese. It was started, with the noble aim of the Universal Catholic Church, to mould young men and women who will strive for excellence in every walks of life and human service. The College is recognized under sections 2 (f) and 12 (B) of the UGC Act 1956. The College was first accredited with 'Five Star' in 1999 and reaccredited with 'A+' in 2006. In the third cycle of accreditation in 2012, the college was again graded at A. In 2017, the college was again reaccredited with 'A' grade. The University Grants Commission (UGC) and the Government of Kerala granted autonomy to this college in the year 2014. In 1996 and 1997, it won the coveted "R Shankar Award" for the Best College in the State, instituted

by the Government of Kerala. In 2004, the UGC identified the College under its “College with Potential for Excellence” scheme. The National Commission for Minority Educational Institution, New Delhi has granted minority status to the college in 2010. All the Science Departments are supported by the FIST of DST, Government of India. It has been ranked among the top 100 Indian colleges by the National Institutional Ranking Framework (NIRF), MHRD, Government of India since 2018.

Occupancy Details	
Particulars	2021-22
Total Students	2994
Staffs	165
Total Occupancy of the college	3159

For calculating per capita carbon emission estimation, only the student strength is taken into account.

Form-A							
BASELINE DATA SHEET FOR GREEN AUDIT							
1	Name of the Organisation	St Berchmans College (Autonomous)					
2	Address (include telephone, fax & e-mail)	ST. BERCHMANS COLLEGE, CHANGANASSERY, KOTTAYAM, 686101, KERALA Email: scas@saintgits.org					
2	Year of Establishment	1922					
3	Name of building and Total No. of Electrical Connections/building	HT II (A) GENERAL (1)					
4	Total Number of Students	Boys	1872	Girls	1122	Total	2994
5	Total Number of Staff	165					
6	Total Occupancy	3159					
7	Total area of green cover (Acre)	20%					
8	Type of Electrical Connection	HT	1	LT	0		
9	Total Connected Load (kW)	363					
10	Average Maximum Demand (KVA)	140					
11	Total built up area of the building (M ²)	41294					
12	Number of Buildings	8					
13	Average system Power Factor	0.94					
14	Details of capacitors connected	NA					
15	Transformer Details (Nos., kVA, Voltage ratio)	TR 1					
		315					
15	DG Set Details (kVA,)	DG1	DG2	DG3	DG4	DG5	Remarks
		125	100				
16	Details of motors	Rating		Nos.		Remarks	
		5 to 10		2			
		10 to 50					
		Above 50					
17	Brief write-up about the firm and the energy/environmental conservation activities already undertaken.	Installed LED Bulbs, Installed 50kWp Solar power plant etc.					
18	Contact Person & Telephone number	Principal					

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METHODOLOGY



2.1. Sensitisation

Low Carbon campus initiatives are successful when everyone in the campus is engaged including students, teachers and staff. A team of students, teachers and staff were formed to participate in the audit. A sensitisation among students and teachers on the concept of carbon footprint was conducted.



During the audit the students and staffs were sensitised on the project and trained to be a part of the data collection team. This helped in conducting the survey in a participatory mode so that the awareness will penetrate to the grass root level. During the data collection field visit it was stressed that the team will spread these ideas to their homes and friends. This will help in a horizontal and vertical spread of the message to a wider group. It is assumed that through 501 occupants of this campuses will reach same number of households. This message will spread to at least 2004 individuals approximately.

2.2 Estimation of carbon footprint

A carbon footprint is the amount of greenhouse gases—primarily carbon dioxide—released into the atmosphere by a particular human activity. A carbon footprint can be a broad measure or be applied to the actions of an individual, a family, an event, an organization, or even entire nation. It is usually measured as tons of CO₂ emitted per year, a number that can be supplemented by tons of CO₂-equivalent gases, including methane, nitrous oxide, and other greenhouse gases.

Global Warming Potential (GWP) is a measure of how much heat a greenhouse gas traps in the atmosphere up to a specific time horizon, relative to carbon dioxide. The

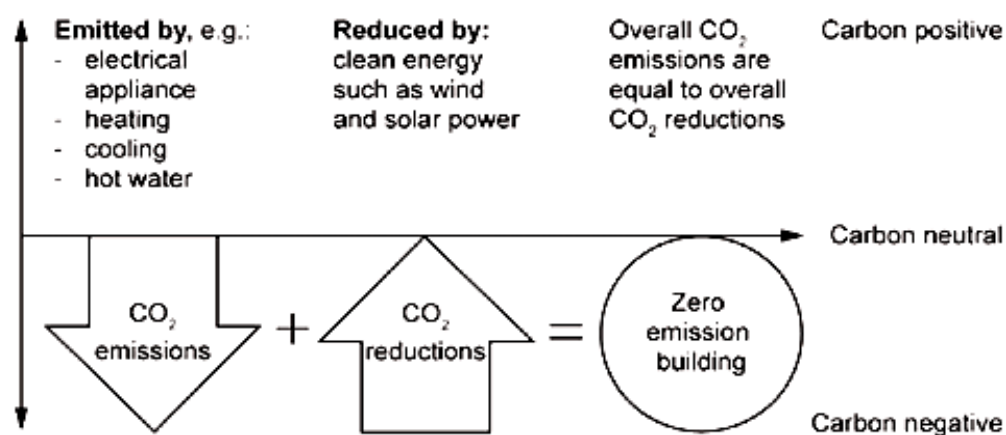
Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide (CO₂).

Global Warming Potentials (IPCC Second Assessment Report)					
Species	Chemical formula	Lifetime (years)	Global Warming		
			20 years	100 years	500 years
Carbon dioxide	CO ₂	variable §	1	1	1
Methane *	CH ₄	12±3	56	21	6.5
Nitrous oxide	N ₂ O	120	280	310	170
HFC-23	CHF ₃	264	9100	11700	9800
HFC-32	CH ₂ F ₂	5.6	2100	650	200
HFC-41	CH ₃ F	3.7	490	150	45
HFC-43-10mee	C ₅ H ₂ F ₁₀	17.1	3000	1300	400
HFC-125	C ₂ H ₂ F ₅	32.6	4600	2800	920
HFC-134	C ₂ H ₂ F ₄	10.6	2900	1000	310
HFC-134a	CH ₂ FCF ₃	14.6	3400	1300	420
HFC-152a	C ₂ H ₄ F ₂	1.5	460	140	42
HFC-143	C ₂ H ₃ F ₃	3.8	1000	300	94
HFC-143a	C ₂ H ₃ F ₃	48.3	5000	3800	1400
HFC-227ea	C ₃ H ₂ F ₇	36.5	4300	2900	950
HFC-236fa	C ₃ H ₂ F ₆	209	5100	6300	4700
HFC-245ca	C ₃ H ₃ F ₅	6.6	1800	560	170
Sulphur hexafluoride	SF ₆	3200	16300	23900	34900
Perfluoromethane	CF ₄	50000	4400	6500	10000
Perfluoroethane	C ₂ F ₆	10000	6200	9200	14000
Perfluoropropane	C ₃ F ₈	2600	4800	7000	10100
Perfluorobutane	C ₄ F ₁₀	2600	4800	7000	10100
Perfluorocyclobutane	c-C ₄ F ₈	3200	6000	8700	12700
Perfluoropentane	C ₅ F ₁₂	4100	5100	7500	11000
Perfluorohexane	C ₆ F ₁₄	3200	5000	7400	10700

The methodology for carbon footprint calculations is still evolving and it is emerging as an important tool for green house management. In the present study carbon emission data from the campus is estimated under four categories viz.

- a. Energy
- b. Transportation
- c. Waste minimisation
- d. Carbon Sequestration

Carbon neutrality refers to achieving net zero GHG emission by balancing the measured amount of carbon released into atmosphere due to human activities, with an equal amount sequestered in carbon sinks. It is crucial to restrict atmospheric concentrations of GHGs released from various socio-economic, developmental and life style activities using biological or natural processes. It is recognized that addressing climate change is not as simple as switching to renewable energy or offsetting GHG emissions. Rather, providing an opportunity for innovation in new developmental activities for viable and effective approach to address the problem.



Energy

In the campus carbon emission from energy consumption is categorised under two headings viz. energy from Electrical and Thermal. Energy used for transportation is calculated under transportation sector.



A detailed energy audit is conducted to understand the energy consumption of the campus. Information on total connected loads, their duration of usage and documents like electricity bills are evaluated. Connected loads are calculated by conducting a survey on electrical equipment on each location. Duration of usage was found out by surveying the users. The survey of equipment was conducted in a participatory mode.

The fuel consumption for cooking was studied by analysing the annual fuel bills and usage schedules during the study. Discussions were carried out with the concerned individuals who actually operate the cooking system.

Transportation

Carbon emission from transportation to be calculated by using the following formula:

Carbon Emission = Number of each type of vehicles × Avg. fuel consumed per year
× Emission factors (based on the fuel used by the vehicle)

Only vehicles operate from the campus will take in to the account of transportation. The private vehicles are not considered for accounting carbon foot print. As private vehicle footprint will be in the account for personal footprint.

Waste Minimisation

The waste generated from the campus is also responsible for the greenhouse gas emission. So, in order to calculate the total carbon foot print of the campus it is necessary to estimate the greenhouse gas emission from the waste generated in the campus by the activity of the students, teachers and staffs.

The calculation of the waste generated has been conducted by keeping measuring buckets for collecting the waste generated in a day. This waste so generated was calculated by weighing it.



Carbon Sequestration

Carbon sequestration is the process involved in the long-term storage of atmospheric carbon dioxide. Trees remove carbon dioxide from the atmosphere through the natural process of photosynthesis and store the carbon in their leaves, branches, stems, bark, and roots



Carbon sequestered by a tree can be found out by using different methods. Since this study is employed the volumetric approach, the calculation consists of five processes.

- Determining the total weight of the tree
- Determining the dry weight of the tree
- Determining the weight of carbon in the tree
- Determining the weight of CO₂ sequestered in the tree
- Determining the weight of CO₂ sequestered in the tree per year

Detailed calculations and results are given below.

Step 1: Determine the total green weight of the tree

The green weight is the weight of the tree when it is alive. First, you have to calculate the green weight of the above-ground weight as follows:

$W_{\text{above-ground}} = 0.25 D^2 H$ (for trees with $D < 11$)

$W_{\text{above-ground}} = 0.15 D^2 H$ (for trees with $D > 11$)

$W_{\text{above-ground}}$ = Above-ground weight in pounds

D = Diameter of the trunk in inches

H = Height of the tree in feet

The root system weight is about 20% of the above-ground weight. Therefore, to determine the total green weight of the tree, multiply the above-ground weight by 1.2:

$$W_{\text{total green weight}} = 1.2 * W_{\text{above-ground}}$$

Step 2: Determine the dry weight of the tree

The average tree is 72.5% dry matter and 27.5% moisture. Therefore, to determine the dry weight of the tree, multiply the total green weight of the tree by 72.5%.

$$W_{\text{dry weight}} = 0.725 * W_{\text{total green weight}}$$

Step 3: Determine the weight of carbon in the tree

The average carbon content is generally 50% of the tree's dry weight total volume. Therefore, in determining the weight of carbon in the tree, multiply the dry weight of the tree by 50%.

$$W_{\text{carbon}} = 0.5 * W_{\text{dry weight}}$$

Step 4: Determine the weight of carbon dioxide sequestered in the tree

CO₂ has one molecule of Carbon and 2 molecules of Oxygen. The atomic weight of Carbon is 12 (u) and the atomic weight of Oxygen is 16 (u). The weight of CO₂ in trees is determined by the ratio of CO₂ to C is 44/12 = 3.67. Therefore, to determine the weight of carbon dioxide sequestered in the tree, multiply the weight of carbon in the tree by 3.67. $W_{\text{carbon-dioxide}} = 3.67 * W_{\text{carbon}}$

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RESULTS AND DISCUSSIONS



3.1 CARBON FOOTPRINT ESTIMATION

3.1.1 ENERGY

a. Electricity

Electricity is purchased from KSEB under One HT connection, the details are given below.

Base line Data (Electricity Bill)	
Code	EA 988
Facility	St Berchmans College (Autonomous)
Provider	KSEB
Contract Demand (kVA)	160
Connected Load (KW)	363
Tariff	HT II (B) GENERAL
Consumer Number	1346360002582
Energy Charge Rs/ kWh Z1	5.85
Energy Charge Rs/ kWh Z2	8.775
Energy Charge Rs/ kWh Z3	4.387
Demand Charge Rs/ kVA	420
Excess Demand Rs/kVA	210
Energy Bill Analysis interval	2021-22

Electricity Bill Analysis

Electricity Bill Details (2021-22)												
Month	Name of the Consumer				St Berchmans College (Autonomous)							
	Contract Demand(kVA)		160		Consumer number & Section			1346360002582				
	Tariff		HT II (B)					Changanacherry				
	kWh				kVA			PF	PF Incentive	PF Penalty	Rs (Total)	Rs/kwh
	Z1	Z2	Z3	Total	Z1	Z2	Z3					
Dec-21	18776	4572	8242	31590	130	57	50	0.97	1781	0	243091	7.70
Jan-22	16420	4718	8174	29312	131	59	54	0.95	0	0	231720	7.91
Feb-22	14868	4482	7876	27226	100	61	55	0.96	769		213810	7.85
Mar-22	20864	5366	9638	35868	140	66	55	0.96	1011	0	274346	7.65
Apr-22	7920	3490	6542	17952	87	60	49	0.91		2022	158281	8.82
May-22	10154	3166	5722	19042	61	41	37	0.91		2149	165291	8.68

Annual Electricity Consumption (kWh)		
Consumer No	2021-22	Connected Load (kW)
1346360002582	321980	363
Total	321980	363

b. Diesel

Diesel Consumption Details				
	Vehicles	Generator	Total	cost
	in L	in L	in L	Rs
2021-22	0	595	595	56542

c. LPG

LPG Consumption Details	
Particulars	2021-22
No Cylinders	40
LPG Consumption in kg	600
Total in kg	600

Base Line Energy Data		
St Berchmans College (Autonomous)		
		2021-22
1	Electricity KSEB (kWh)	321980
2	Electricity Solar - Off grid (kWh)	0.00
3	Electricity (KSEB + Off grid) kWh	321980
4	Electricity Grid Tied (kWh)	63875
5	Diesel (L)	595
6	LPG (kg)	600.00
7	Biogas (m3)	0.00

Energy Consumption Profile		
SI No	Fuel	2021-22 (kCal)
1	Electricity	276902800
2	Diesel	6249379
3	LPG	7200000
4	Biogas	0
Total		290352179

Thermal Fuel Consumption	
St Berchmans College (Autonomous)	
	2021-22
Annual LPG consumption in kg	600
Annual Diesel consumption in L	595
Annual petrol consumption in L	0
Annual Biogas consumption in m3	0

Specific Energy Consumption

OTTOTRACTIONS- ENERGY AUDIT		
St Berchmans College (Autonomous)		
Energy Performance Index (EPI)		
SI No	Particulars	2021-22
1	Total building area (m ²)	41294
2	Annual Energy Consumption (kCal)	290352179
3	Annual Energy Consumption (kWh)	337619
4	Total Energy in Toe	29.04
5	Specific Energy Consumption kWh/m ²	8.18

3.3. Waste Generation total

The major concern of waste management will be focused on the solid waste produced by the campus. Solid wastes produced in the campus are mainly of three types, food waste, paper waste, and plastic waste. Food wastes produced in the campus are mainly by two means. The vegetable wastes produced in the kitchen during the food preparation. The food waste produced by the students and staffs of the campus after the consumption of meals.



Degradable Waste

Degradable Waste Generation	
St Berchmans College (Autonomous)	
Particulars	2021-22
Total Occupancy	3159
Waste generated in kg /day	63.18
Waste generated in kg /Yr	13899.6

Non-Degradable waste

Solid non degradable Waste Generation	
St Berchmans College (Autonomous)	
Particulars	2021-22
Total Occupancy	3159
Waste paper generated in kg /day	0.6318
Waste plastic generated in kg /day	0.9477
Waste paper generated in kg /Yr	139.00
Waste plastic generated in kg /Yr	208.49

Carbon Emission Profile (2021-22)

Carbon emissions in the campus due to the day-to-day activities are calculated and is discussed below. The emission factors considered for estimation and its units are given.

Emission Factors		
Item	Factor	Unit
Electricity	0.00082	tCo ₂ e/kWh
LPG	0.0015	tCo ₂ e/kg
Diesel	0.0032	tCo ₂ e/kg
Petrol	0.0031	tCo ₂ e/kg
Food Waste	0.00063	tCo ₂ e/kg
Paper Waste	0.00056	tCo ₂ e/kg
Plastic Waste	0.00034	tCo ₂ e/kg

Carbon Foot Print 2021-22

Carbon Foot Print			
Sl. No.	Particulars	2021-22	tCO ₂ e
1	Electricity (kWh)	321980	264.02
2	Diesel (L)	595	1.90
3	LPG (kg)	600.00	0.90
4	Biogas (m ³)	0.00	0.00
5	Degradable Waste in kg/yr.	13899.6	8.76
6	Paper Waste in kg/yr	139.00	0.08
Total Carbon Foot Print tCO₂e/yr			275.66

3.5. CARBON SEQUESTRATION

All the activities including energy consumption and waste management have their equivalent carbon emission and they positively contribute to the carbon footprint of the campus. Carbon sequestration is the reverse process, at which the emitted carbon dioxide will get sequestered according to the type of carbon sequestration employed. Even though there are many natural sequestration processes are involved in a campus, the major type of sequestration among them is the carbon sequestration by trees.

Carbon Sequestration	
Particulars	2021-22
Carbon sequestered by trees in the campus (tCO ₂ e)	4.31

Trees sequester carbon dioxide through the biochemical process of photosynthesis and it is stored as carbon in their trunk, branches, leaves and roots. The amount of carbon sequestered by a tree can be calculated by different methods. In this study, the volumetric approach was taken into account, thus the details including CBH (Circumference at Breast Height), height, average age, and total number of the trees, are required. Details of the trees in the campus compound are given in the Table 3.18. Detailed table is included in the technical supplement.

Carbon sequestered by a tree can be found out by using different methods. Since this study is employed the volumetric approach, the calculation consists of five processes.

- Determining the total weight of the tree

- Determining the dry weight of the tree
- Determining the weight of carbon in the tree
- Determining the weight of CO₂ sequestered in the tree
- Determining the weight of CO₂ sequestered in the tree per year

Carbon sequestered by each species of trees in the campus compound is given in the technical supplement.

CARBON FOOTPRINT OF THE CAMPUS (2021-22)

Various carbon emitting activities such as consumption of energy, transportation and waste generation leads to the total emission of **275.66 tCO₂e** per year by the campus. The total carbon sequestration by trees in the campus compound is **4.31 tCO₂e**.

Thus, the current carbon footprint of the campus will be the difference of total carbon emission and total carbon sequestration/mitigation. the following table shows the carbon footprint level of 2021-22.

Specific CO₂ Footprint

Amount of Carbon to be mitigated for Low Carbon Campus		
SI No	Particulars	2021-22
1	Total carbon emission tCO ₂ e	275.66
2	Total carbon sequestration tCO ₂ e	4.31
3	Amount of carbon mitigated through renewable energy tCO ₂ e	52.38
4	To be mitigated tCO ₂ e	218.98
5	Total No of Students	2994
6	Specific Carbon Footprint kg CO ₂ e/Student/Yr	73.14

The total specific carbon emission is estimated as **73.14** kg of CO₂e per student for the year 2021-22.

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Carbon Mitigation Plans



The total emission of the carbon dioxide per student is **73.14** kg per year (2021-2022). Emission reduction plans were prepared to bring the existing per capita carbon footprint to zero or below so as to bring the campus a carbon neutral or carbon negative campus.

This can be achieved in many ways but, every alternate plan must be in such a way that, it must fulfill the actual purpose of each activity that is considered.

Here, three major methods are taken in to account as the plans for reducing the carbon emission of the campus.

- Resource optimisation
- Energy efficiency
- Renewable energy

RESOURCE OPTIMISATION

The effective use of resources can limit its unnecessary wastage. Optimal usage of the resources (such as fuels) can save the fuel and can also reduce the carbon emission due to its consumption. This technique can be effectively implemented in the 'transportation' and 'waste' sectors of the campus.

WASTE MINIMISATION

Optimal utilisation of paper and plastic stationaries can reduce the frequency of purchase of items. This can reduce the unnecessary wastage of money as well as the excess production of waste. In the case of food, proper food habits and housekeeping practices can optimise its usage.

Currently, the campus is taking an appreciable effort to reduce the unnecessary production of wastes. But the campus still has opportunities to reduce the generation of waste and can improve much more. Resource optimisation can be effectively implemented in all type of waste generated in the campus and the campus can expect about 50% reduction the total waste produced.

ENERGY EFFICIENCY

Energy efficiency is the practice of reducing the energy requirements while achieving the required energy output. Energy efficiency can be effectively implemented in all the sectors of the campus.

FUELS FOR COOKING

The campus uses commercial LPG cylinders for its cooking purpose. Installation of a solar water heater to rise the water temperature to a much higher level, then it has to consume only very less amount of thermal energy for preparing the same amount of food is another method. This can make a positive benefit to the campus by saving money, energy and can reduce the carbon emission of the campus due to thermal energy consumed for cooking.

TRANSPORTATION

Energy efficiency of the transportation sector is mainly depended on the fuel efficiency of the vehicles used. Here mileage of the vehicle (kmpl - Kilometres per Litre) is calculated to assess the fuel efficiency of the vehicle.

Percentage of closeness is the ratio of actual mileage of the vehicle to its expected mileage. If the percentage of closeness of mileages of each vehicle is greater than that of its average, then the efficiency status of the vehicle is considered as 'Above average' and else, it is considered as 'Below average'

Carbon Mitigation Proposals

After analyzing the historical and measured data the following projects are proposed to make the campus carbon neutral. The projects are from energy efficiency and renewable energy. The further additions in the green cover increase will also give positive impact in the carbon mitigation.

OTTOTRACTIONS- ENERGY AUDIT						
St Berchmans College (Autonomous)						
Greenhouse Gas Mitigation through Major Energy Efficiency Projects						
Sl No	Projects	Energy saved(Yearly)		Sustainability (Years)	First year ton of CO2 mitigated	Expected Tons of CO2 mitigated through out life cycle
		(kWh)	MWh	Years		
1	Energy Saving in Lighting by replacing existing 800 No's T8 (40W) Lamps to 18W LED Tube	16896	16.90	10	12.33	123.34
2	Energy Saving by replacing existing 300 No's in-efficient ceiling fans with Energy Efficient Five star fans	11290	11.29	10	8.24	82.41
Total		28186	28	10	20.58	205.75

OTTOTRACTIONS- ENERGY AUDIT						
St Berchmans College (Autonomous)						
Greenhouse Gas Mitigation through Renewable Energy Projects						
Sl No	Projects	Energy saved(Yearly)		Sustainability (Years)	First year ton of CO2 mitigated	Expected Tons of CO2 mitigated through out life cycle
		(kWh)	MWh	Years		
1	Installation of 220kWp Solar Power Plant	281050	281.05	25	205.17	5129.16
Total		281050	281	25	205.17	5129

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
St Berchmans College (Autonomous)					
SI No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 800 No's T8 (40W) Lamps to 18W LED Tube	2.40	1.369	21.04	16896
2	Energy Saving by replacing existing 300 No's in-efficient ceiling fans with Energy Efficient Five star fans	9.00	0.914	118.10	11290
3	Installation of 220kWp Solar Power Plant	121.00	37.38	38.84	281050
	Total	11.40	2.28	139.15	28185.60
(The saving are projected as per the assumed operation time observed based in the discussions with the plant officials. The data of saving percentages are taken from BEE guide books and field measurements.)					

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5 CONCLUSION



The carbon emission from different sectors namely, Energy, Transportation and wastes were calculated using standard procedures. Carbon sequestration by the trees present in the campus was also estimated. From these the total carbon footprint of the campus was arrived at.

Net Carbon Emission after implementing Energy Efficiency projects and Renewable Energy Projects Proposed		
1	Total Carbon Foot Print tCO ₂ e/yr	275.66
2	Carbon Sequestered tCO ₂ e/yr	4.31
3	Carbon mitigated by Renewable Energy tCO ₂ e/yr (Installed)	52.38
4	Carbon mitigated by Renewable Energy tCO ₂ e/yr (Proposed)	205.17
5	Carbon mitigated by Energy Efficiency (Proposed) tCO ₂ e/yr	20.58
6	Effective Carbon footprint tCO ₂ e/yr	-6.77
7	Total No of Students	2994
8	Specific Carbon Footprint kg CO ₂ e/Student/Yr	-2.26

From this study it was found that carbon footprint of the campus to be **-2.26 kgCO₂e/ Student/ Year** in place of current footprint i.e., **73.14 kgCO₂e/ student/ Year**. This will be achieved after implementing energy efficiency projects and implementation of 220kWp solar power plant. To achieve this an investment of **132.40 lakhs Rs** is required through energy efficiency and renewable energy projects proposed. It will be around **4422 Rs per student** to make the campus the carbon negative.

Cost to make the campus Carbon Negative		
1	Cost of implementation in Energy Efficiency Lakhs Rs	11.40
2	Cost of implementation in Renewable Energy Lakhs Rs	121.00
3	Total Lakhs Rs	132.40
4	Total number of students	2994
5	Cost per student to make the campus carbon negative Rs/ Student	4422

REFERENCES

Reports and Books

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- Home Energy Audit Manual (2017), Ottotractions & EMC Kerala, No.ES 26, Pp.114
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- <http://www.sustainabilityoutlook.in/content/5-things-consider-you-plan-rooftop-pv-plant>
- <https://www.nrcan.gc.ca/energy/efficiency/transportation/20996>
- <https://www.americangeosciences.org/critical-issues/faq/how-does-recycling-save-energy>

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6

TECHNICAL SUPPLEMENT



DEPARTMENT OF BOTANY
ST BERCHMANS COLLEGE CHANGANACHERRY

LIST OF PLANTS

Sl No.	Species Name	Family
1.	<i>Acacia mangium</i> Willd.	Mimosaceae
2.	<i>Acalypha hispida</i> Burm.f.	Euphorbiaceae
3.	<i>Adenantha pavonina</i> L.	Mimosaceae
4.	<i>Adenocalymna alliaceum</i> Miers.	Bignoniaceae
5.	<i>Agave americana</i> L.	agavaceae
6.	<i>Alangium salvifolium</i> (L.f.) Wang.	<i>Alangiaceae</i>
7.	<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae
8.	<i>Alstonia venenata</i> R. Br.	Apocynaceae
9.	<i>Anamirta cocculus</i> (L.) Wight & Arn.	Menispermaceae
10.	<i>Antidesma ghaesembilla</i> Gaertn.	Euphorbiaceae
11.	<i>Ardisia littoralis</i> Andr.	Myrsinaceae
12.	<i>Artabotrys hexapetalus</i> (L. f.) Bhandari	Annonaceae
13.	<i>Artocarpus hirsutus</i> Lam.	Moraceae
14.	<i>Asparagus racemosus</i> Willd.	Asparagaceae
15.	<i>Averrhoa bilimbi</i> L.	Averrhoaceae
16.	<i>Azadirachta indica</i> A.Juss.	Meliaceae
17.	<i>Bambusa multiplex</i>	Poaceae
18.	<i>Bambusa vulgaris</i>	Bambusaceae
19.	<i>Bauhinia acuminata</i> L.	Caesalpiniaceae
20.	<i>Bauhinia tomentosa</i> L.	Caesalpiniaceae
21.	<i>Berrya cordifolia</i> (Willd.) Burret	Tiliaceae
22.	<i>Bixa orellana</i> L.	Bixaceae
23.	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae
24.	<i>Caesalpinia sappan</i> L.	Caesalpiniaceae
25.	<i>Caladium bicolor</i> (Ait. ex Dryand.) Vent.	Araceae
26.	<i>Calamus rotang</i> L.	Areacaceae
27.	<i>Calliandra haematocephala</i> Hassk.	Mimosaceae
28.	<i>Cananga odorata</i> (Lam.) Hook. f. & Thoms.	Annonaceae
29.	<i>Canarium strictum</i> Roxb.	Burseraceae
30.	<i>Carallia brachiata</i> (Lour.) Merr.	Rhizophoraceae
31.	<i>Careya arborea</i> Roxb.	Lecithidaceae
32.	<i>Carica papaya</i> L.	Caricaceae
33.	<i>Carmona retusa</i> (Vahl) Masamune	Boraginaceae
34.	<i>Caryota urens</i> L.	Arecaceae
35.	<i>Cassia fistula</i> L.	Caesalpiniaceae
36.	<i>Cayratia pedata</i> (Lam.) A. Juss. ex Gagnep.	Vitaceae
37.	<i>Cestrum nocturnum</i> L.	Solanaceae
38.	<i>Chassalia curviflora</i> (Wall. ex Kurz) Thw.	Rubiaceae
39.	<i>Chrysophyllum cainito</i> L.	Sapotaceae
40.	<i>Chrysophyllum cainito</i> L.	Sapotaceae

41.	<i>Citrus sp.</i>	Rutaceae
42.	<i>Clerodendrum infortunatum</i> L.	Verbenaceae
43.	<i>Clitoria ternatea</i> L.	Fabaceae
44.	<i>Coccinia grandis</i> (L.) Voight	Cucurbitaceae
45.	<i>Coffea arabica</i> L.	Rubiaceae
46.	<i>Colocasia esculenta</i> (L.) Schott	Araceae
47.	<i>Colubrina travancorica</i> Bedd.	Rhmnaceae
48.	<i>Crataeva magna</i> (Lour.) DC.	Capparidaceae
49.	<i>Crotalaria pallida</i> Dryand.	Fabaceae
50.	<i>Cyclea peltata</i> (Lam.) Hook. f. & Thoms.	Menispermaceae
51.	<i>Desmodium gangeticum</i> (L.) DC.	Fabaceae
52.	<i>Desmodium motorium</i> (Houtt.) Merr.	Fabaceae
53.	<i>Dillenia suffruticosa</i> (Griff.) Mart.	Dilleniaceae
54.	<i>Dioscorea alata</i> L.	Dioscoreaceae
55.	<i>Diospyros buxifolia</i> (Blume) Hiern	Ebenaceae
56.	<i>Diospyros discolor</i> Willd.	Emenaceae
57.	<i>Dypsis lutescens</i> (Wendl.) Beentje & Dransf.	Arecaceae
58.	<i>Elaeocarpus serratus</i> L.	Elaeocarpaceae
59.	<i>Elaeocarpus sp.</i>	Elaeocarpaceae
60.	<i>Fagraea ceilanica</i> Thunb.	Loganiaceae
61.	<i>Ficus auricularia</i>	Moraceae
62.	<i>Ficus pumila</i> L.	Moraceae
63.	<i>Ficus racemosa</i> L.	Moraceae
64.	<i>Flacourtia montana</i> Graham	Flacourtiaceae
65.	<i>Garcinia mangostana</i> L.	Clusiaceae
66.	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Fabaceae
67.	<i>Grewia nervosa</i> (Lour.) Panigrahi	Tiliaceae
68.	<i>Gymnema sylvestre</i> (Retz.) R. Br.	Asclepiadaceae
69.	<i>Hamelia patens</i> Jacq.	Rubiaceae
70.	<i>Helicteres isora</i> L.	Sterculiaceae
71.	<i>Hemigraphis colorata</i> Hallier f.	Acanthaceae
72.	<i>Hydnocarpus pentandra</i> (Buch.-Ham.) Oken	Flacourtiaceae
73.	<i>Hymenodictyon orixense</i> (Roxb.) Mabb.	Rubiaceae
74.	<i>Ichnocarpus frutescens</i> (L.) R. Br.	Apocynaceae
75.	<i>Ixora finlaysoniana</i> Wall. ex G. Don	Rubiaceae
76.	<i>Justicia adhatoda</i> L.	Acanthaceae
77.	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae
78.	<i>Kopsia fruticosa</i> (Ker-Gawl.) A. DC.	Apocynaceae
79.	<i>Leea indica</i> (Burm. f.) Merr.	Leeaceae
80.	<i>Leucaena leucocephala</i> (Lam.) de Wit	Mimosaceae
81.	<i>Litsea coriacea</i> (Heyne ex Meisner) Hook. f.	Lauraceae
82.	<i>Livistona chinensis</i> (Jacq.) R.Br. ex Mart.	Areacaceae
83.	<i>Macaranga peltata</i> (Roxb.) Muell.-Arg.	Euphorbiaceae
84.	<i>Madhuca neriifolia</i> (Moon) H. J. Lam	Sapotaceae
85.	<i>Magnolia champaca</i> (L.) Baill. ex Pierre	Magnoliaceae
86.	<i>Mangifera indica</i> L.	Anacardiaceae
87.	<i>Memecylon umbellatum</i> Burm.f.	Melastomaceae

88.	<i>Mesua ferrea</i> L.	Clusiaceae
89.	<i>Mimusops elengi</i> L.	Sapotaceae
90.	<i>Morinda citrifolia</i> L.	Rubiaceae
91.	<i>Moringa oleifera</i> Bedd.	Moringaceae
92.	<i>Murraya paniculata</i> (L.) Jack.	Rutaceae
93.	<i>Mussaenda frondosa</i> L.	Rubiaceae
94.	<i>Myristica fragrans</i> Houtt.	Myristicaceae
95.	<i>Myxopyrum smilacifolium</i> (Wall.) Blume	Oleaceae
96.	<i>Nerium oleander</i> L.	Apocynaceae
97.	<i>Nyctanthes arbor-tristis</i> L.	Oleaceae
98.	<i>Ochna integerrima</i> (Lour.) Merr.	Ocnaceae
99.	<i>Ocimum gratissimum</i> L.	Lamiaceae
100.	<i>Ocimum tenuiflorum</i> L.	Lamiaceae
101.	<i>Olea dioica</i> Roxb.	Oleaceae
102.	<i>Persea americana</i> Mill.	Lauraceae
103.	<i>Phyllanthus emblica</i> L.	Euphorbiaceae
104.	<i>Pimenta dioica</i> (L.) Merr.	Myrtaceae
105.	<i>Plumbago zeylanica</i> L.	Plumbaginaceae
106.	<i>Pongamia pinnata</i> (L.) Pierre,	Fabaceae
107.	<i>Pothos scandens</i> L.	Araceae
108.	<i>Pouteria campechiana</i> (Kunth) Baehni	Sapotaceae
109.	<i>Psilanthus travancorensis</i> (Wight & Arn.) Leroy	Rubiaceae
110.	<i>Pterocarpus marsupium</i> Roxb.	Fabaceae
111.	<i>Pterocarpus santalinus</i> L.f.	Fabaceae
112.	<i>Pterospermum rubiginosum</i> Heyne ex Wight & Arn.	Sterculiaceae
113.	<i>Quassia amara</i> L.	Simaroubaceae
114.	<i>Samanea saman</i> (Jacq.) Merr.	Mimosaceae
115.	<i>Santalum album</i> L.	Santalaceae
116.	<i>Saraca asoca</i> (Roxb.) de Wilde	Caesalpiniaceae
117.	<i>Simarouba glauca</i> DC.	Simaroubaceae
118.	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Verbenaceae
119.	<i>Sterculia balanghas</i> L.	Sterculiaceae
120.	<i>Stereospermum colais</i> (Buch.-Ham. ex Dillw.) Mabb.	Bignoniaceae
121.	<i>Strobilanthes ciliatus</i> Nees	Acanthaceae
122.	<i>Swietenia macrophylla</i> King	Miliaceae
123.	<i>Syzigium zeylanica</i>	Myrtaceae
124.	<i>Syzygium caryophyllatum</i> (L.) Alston	Myrtaceae
125.	<i>Tabernaemontana divaricata</i> (L.) R. Br.	Apocynaceae
126.	<i>Tecoma stans</i> (L.) HBK	Bignoniaceae
127.	<i>Tectona grandis</i> L. f.	Verbanaceae
128.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae
129.	<i>Terminalia chebula</i> Retz.	Combretaceae
130.	<i>Terminalia cuneata</i> Roth	Combretaceae
131.	<i>Thunbergia erecta</i> (Benth.) Anders.	Acanthaceae
132.	<i>Thunbergia grandiflora</i> (Roxb. ex Rottl.) Roxb.	Acanthaceae
133.	<i>Tiliacora acuminata</i> (Poir.) Miers ex Hook.f. & Thoms.	Menispermaceae
134.	<i>Tinospora cordifolia</i> (Willd.) Miers.	Menispermaceae

135.	<i>Tradescantia spathacea</i> Sw.	Commelinaceae
136.	<i>Vinca rosea</i>	Apocynaceae
137.	<i>Vitex altissima</i> L. f.	Verbenaceae
138.	<i>Wattakaka volubilis</i> (L. f.) Stapf	Asclepiadaceae
139.	<i>Woodfordia fruticosa</i> (L.) Kurz	Lytraceae
140.	<i>Wrightia tinctoria</i> (Roxb.) R. Br.	Apocynaceae
141.	<i>Ziziphus oenoplia</i> (L.) Mill.	Rhamnaceae
142.	<i>Ricinus communis</i>	Euphorbiaceae
Gymnosperms		
143.	<i>Cycas circinalis</i> L.	Cycadaceae
144.	<i>Cycas revoluta</i>	Cycadaceae
145.	<i>Cycas zeylanica</i>	Cycadaceae
146.	<i>Podoarpus</i> (Two species)	podocarpaceae
147.	<i>Dioon Sp.</i>	Cycadaceae
148.	<i>Pinus sp.</i>	Pinaceae
149.	<i>Agathis sp.</i>	Araucariaceae
150.	<i>Zamia</i> (Three species)	Zamiaceae
151.		

New Additions

1.	<i>Alstonia venenata</i> R. Br.	Apocynaceae
2.	<i>Ardisia littoralis</i> Andr.	Myrsinaceae
3.	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae
4.	<i>Citrus sp.</i>	Rutaceae
5.	<i>Clerodendrum infortunatum</i> L.	Verbenaceae
6.	<i>Clitoria ternatea</i> L.	Fabaceae
7.	<i>Desmodium motorium</i> (Houtt.) Merr.	Fabaceae
8.	<i>Dillenia suffruticosa</i> (Griff.) Mart.	Dilleniaceae
9.	<i>Fagraea ceilanica</i> Thunb.	Loganiaceae
10.	<i>Justicia adhatoda</i> L.	Acanthaceae
11.	<i>Magnolia champaca</i> (L.) Baill. ex Pierre	Magnoliaceae
12.	<i>Nerium oleander</i> L.	Apocynaceae
13.	<i>Ophiorrhiza mungos</i>	rubiaceae
14.	<i>Plumbago zeylanica</i> L.	Plumbaginaceae
15.	<i>Santalum album</i> L.	Santalaceae
16.	<i>Cycas zeylanica</i>	Cycadaceae
17.	<i>Podoarpus</i> (Two species)	podocarpaceae
18.	<i>Dioon Sp.</i>	Cycadaceae
19.	<i>Pinus sp.</i>	Pinaceae
20.	<i>Agathis sp.</i>	Araucariaceae
21.	<i>Zamia</i> (Three species)	Zamiaceae

Pteridophytes - 22 species, Nepanthus etc..

KERALA STATE ELECTRICITY BOARD LIMITED

Office of the Special Officer(Revenue), Pattom, Thiruvananthapuram

DEMAND NOTICE FOR SEPTEMBER 2022

(As per CHAPTER VII OF KERALA ELECTRICITY SUPPLY CODE -2014)

Con.	1346360002582	Bill Date	02-Sep-2022	Due Date	09-Sep-2022	Bill.No	21028111001991 Ver : 0
Tariff	HT II (A) GENERAL	Last Date	24-Sep-2022	CD	523940	BG	0

ST.BERCHMANS COLLEGE SB College, VAZHAPALLY, Changanassery, Kottayam,, Mobile no--9961004977 <p style="text-align: center;">LCN :1/4952</p>	SBI Virtual A/c No(IFS Code:SBIN0070493)-KSEBHT1C4952 KSEBL WISHES YOU A VERY HAPPY ONAM Consumer GSTIN_ID- /KSEB (L)GST ID=32AAECK2277NBZ1
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Arrears as on 31-Jul-2022				Date of Previous Reading	31-Jul-2022	Email: bursarsbc@gmail.com	
Disputed	0	Undisputed	0	Date of Present Reading	31-Aug-2022	Supply Voltage	11 kV HT
Contract Demand(kVA)	75% of CD (KVA)	130% of CD (KVA)	Connected Load (KW)	Average			Billing Type
160.0	120.0	208.0	363.85	MD (kVA)	Consumption (kWh)	PF	DPS
				97.09	22078	0.94	Section
							Changanacherry
							Circle
							Kottayam

Reading Details of meter NET METER 4952-Working (KVA,KWh,KVAh & KVArh) for 08-2022														
1. Energy Consumption(KWh)					3. Energy Consumption(KVArh) Lag and kVArh (Lead)									
Zone	FR	IR	MF	Units	Zone	FR	IR	MF	Units	FR	IR	Units		
1	304625.00	297564.00	2.000	14088	1	83578.0	81222.0	2.000	4712	274.00	274.00	0		
2	91948.00	89696.00	2.000	4504	2	23186.0	22537.0	2.000	1298	66.00	66.00	0		
3	163487.00	159521.00	2.000	7932	3	55381.0	53895.0	2.000	2972	110.00	110.00	0		
Total				26524	Total kVArh(Lag)				8982	kVArh(Lead)				0
2. Energy Consumption(KVAh)					4. Demand (KVA)			Readings		MF		Units		
Zone	FR	IR	MF	Units	1		54.529		2.000		109.06			
1	319982.00	312446.00	2.000	15072	2		27.14		2.000		54.28			
2	95304.00	92950.00	2.000	4708	3		27.586		2.000		55.17			
3	173799.00	169556.00	2.000	8486	5.Factory Lighting							0.0		
Total				28266	6.Colony Lighting							0.0		
Ave.PF=KWh/KVAh				0.94	7.Generator							4125		

INVOICE					
	Unit	Rate	Amount (Rs)		Amount
1.Total Demand Charge				9.Other Charges	
a. Demand Charge - Normal	120.0	420.000	50400.00	Reconnection Fee	0.00
b. Demand Charge - Peak	0.0	420.000	0.00	Charges for Belated Payments	779.00
c. Demand Charge - Off peak	0.0	420.000	0.00		
d. Excess Demand Charge	0.0	210.000	0.00		
e. Excess Demand Charge(Peak)	0.0	210.000	0.00		
f. Excess Demand Charge (Off)	0.0	210.000	0.00		
Sub Total (a+b+c+d+e+f)			50400.00		
2.Total Energy Charges					
a. Energy charges - Normal	14088	5.850	82414.80		
b. Energy charges - Peak	4504.0	8.775	39522.60		
c. Energy charges - Off peak	7932.0	4.387	34801.65		
Sub Total(a+b+c)			156739.05		
3.PF Incentive / Disincentive			783.70		
Total Energy Charge			157522.75		
4.Energy Charges on Lighting load					
a.Factory Lighting	0	0.2		10.Total(add 1 to 9)	225088.26
b.Colony Lighting	0	0.2	0.00	Plus/Minus (Round off)	-0.26
Sub Total(a+b)				UnDisputed Arr Amount	0.00
5.Electricity Duty	156739	0.100	15673.91	Less	1. Advance / Credit
6.Ele. Surcharge	26524	0.025	663.10		2. CD Interest
7.Duty on self generated energy	4125	0.012	49.50		3. CD Refund
8.Penalty for non-segn. of light load					
				Net Payable	225088.00

(Rupees Two Lakh Twenty Five Thousand Eighty Eight Only)

E & O.E **Balance Advance at Credit, if any**

Please follow our official Facebook page fb.com/ksebl for information & announcements.

(instructions) SPECIAL OFFICER (REVENUE)

1346360002582	21028111001991	Rs.225088.00	September 2022
ST.BERCHMANS COLLEGE			
Date	<input type="text" value="DDMMYY"/>		
DD/Payment Instruction	<input type="text"/>		
Name of the Bank	<input type="text"/>		
			Signature

Please Detach and enclose with the DD

GENERAL INSTRUCTIONS

1. Payment of Monthly Energy Charges can be made through the following modes
 - i) Through RTGS/NEFT to SBI Virtual Account Number allotted to each consumer maintained at SBI KSEB Administrative Complex Branch, Pattom (IFS Code SBIN0070493)
 - ii) Online Payment can be made through ht.kseb.in Login with registered User Name and Password. For online payment related support contact E-Mail: htbillsupport@kseb.in
 - iii) Through RTGS/NEFT to the A/c No 57065480091 of SO(R) maintained at SBI, KSEB Admin. Complex Branch, Pattom, Thiruvananthapuram-4 (IFS Code SBIN0070493) . Please insist your bankers to note your consumer code (LCN) on such fund transfer and the details of such remittance may please be forwarded to this office for verification and reconciliation.
 - iv) Through DD drawn in favour of Special Officer(Revenue) payable at Thiruvananthapuram. In all cases of remittance, the date of credit in the non-operative collection account of the SO(R) by the bank will only be treated as the date of remittance.

2. Incentive will be given for payments 5 days before due date at the rates fixed from time to time.
3. Non receipt of invoice cannot be a plea for non payment of bills in time. Bills are being mailed to the registered email id and SMS send to the registered mobile no. Please login our web site ht.kseb.in to view your bill. Information regarding dues should be obtained from the O/o the Special Officer (Revenue) if the invoice is not received before 10th of the month succeeding the month of consumption.

4. Always quote the consumer code number (LCN) in all your correspondences.
5. Rebate is allowable on advance remittance of Electricity Charges for SIX months or ONE year.
6. For belated payments charges will be levied at the rate fixed from time to time.

7. Address and Phone nos of:
State Electricity Ombudsman, Charangattu Bhavan, Building No.38/2829, Mamangalam- Anchumana Road, Edapally Kochi-682024 Phone: 0484 2346488, Mobile:9539913269, email:ombudsmanelectricity@gmail.com, website:www.keralaeo.org
CGRF-SOUTH-Chairperson, CGRF, KSEB, Vydyuthi Bhavanam, Kottarakkara- 691506
Ph:0474 2451300
CGRF- CENTRAL - Chairperson, CGRF, 220KV Substation Compound, Kalamassery-683503 Ph:0484 2556500, Mobile: 9496008719
CGRF-NORTH – Chairperson, CGRF, KSE Board, Vydyuthi Bhavanam, Gandhi Road, Kozhikode-673032 Phone:0495 2367820

8. Any changes in installation wattage shall only be done with the approval of licensee.

Differential Pricing Method

Time Zone-1 Normal 6.00 hrs to 18.00 hrs
Time Zone-2 Peak 18.00 hrs to 22.00 hrs
Time Zone-3 Off Peak 22.00 hrs to 06.00 hrs

Demand Charge (DC) = Billing Demand X Rate

Billing Demand = Recorded Maximum Demand in Zone-1, Zone-2, Zone-3 or 75% of Contract Demand whichever is higher.

Exces Demand shall be

In Time Zone-1 ED1 = (RMD1-CD)

In Time Zone-2 ED2= (RMD2-CD)

In Time Zone-3 ED3= (RMD3-(1.3XCD))

Excess Demand Charge EDC = ED1, ED2 or ED3 whichever is higher X 0.5 X Rate

Energy Charge in each Time Zone will be (For all consumers except Domestic)

Total Demand Charge = DC+EDC

In Time Zone-1 EC1= Consumption in Zone-1 X Rate

In Time Zone-2 EC2= Consumption in Zone-2 X Rate X 1.5

In Time Zone-3 EC3= Consumption in Zone-3 X Rate X 0.75

For Domestic Consumers

In Time Zone-1 EC1= Consumption in Zone-1 X Rate

In Time Zone-2 EC2= Consumption in Zone-2 X Rate X 1.2

In Time Zone-3 EC3= Consumption in Zone-3 X Rate X 0.90

Total Energy Charge EC = EC1+EC2+EC3

Power Factor Incentive and Disincentive

Power factor between 0.95 to 1.00 incentive at 0.50% of energy charges for every increase of 0.01 from 0.95 and disincentive at 0.50% of energy charges for each 0.01 fall from 0.95 upto 0.90 and at 1% of energy charges for every drop of 0.01 from 0.90. No PF Incentive/ Disincentive for consumers with leading power

For more clarification of invoice/Payment/Bank Guarantee please contact

The Special Officer (Revenue),
Kerala State Electricity Board Ltd, Vydyuthi Bhavanam, Pattom, Thiruvananthapuram 695004
Phone 0471 2514315 E-mail : sorkseb@kseb.in

For Billing Details contact

LCN 2/,3/,7/,20/,21/,33/ 0471 251 4612

LCN 17/,18/,19/,27/,31/,32/ 0471 251 4423

LCN 1/,5/,8/,13/,23/,28/,29/,30/,35/(KWA/Minor Irrigation) 0471 251 4314

LCN 9/,15/,26/,34/36/(BSNL) 0471 251 4246

LCN 4/,6/,10/,11/,12/,16/,24/,25/ 0471 251 4438

Centralized Govt LT Billing 0471 251 4315 CUG 949 601 1912

For Collection & Accounting related details 0471 251 4371 CUG 949 601 8456

For Bank Guarantee related details 0471 251 4271