



Energy audit

Dr. K. K. John Principal

Saintgits College of Applied Sciences Kottukulam Hills, Pathamuttom P.O. Kottayam- 686 532, Kerala



CAMPUS

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Report

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ENERGY AUDIT REPORT

SAINTGITS COLLEGE OF APPLIED SCIENCES

KOTTAYAM





OTTOTRACTIONS



Accredited Energy Auditor: AEA-33
Empanelled Accredited Energy Auditor: EmAEA-33
Bureau of Energy Filtenery,
Government of India.



Empanelled Energy Auditor: EMCEEA-0211F.



Saintgits College of Applied Science Kottayam- 686 532, Kerom P.





Certification

This is to certify that

The data collection has been carried out diligently and truthfully;

All data monitoring devices are in good working condition and have been calibrated or certified by approved agencies authorised and no tampering of such devices has occurred;

All reasonable professional skill, care and diligence had been taken in preparing the energy audit report and the contents thereof are a true representation of the facts;

Adequate training provided to personnel involved in daily operations after implementation of recommendations; and

The energy audit has been carried out in accordance with the Bureau of Energy Efficiency (Manner and Intervals of Time for the Conduct of Energy Audit) Regulations, 2010.

SURESH BABU B V ACCREDITED ENERGY AUDITOR (AEA 33)

Dr. K. K. John

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Kottayam- 686 532, Keraia

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ENERGY AUDIT REPORT SAINTGITS COLLEGE OF APPLIED SCIENCES PATHAMUTTOM







Energy Audit Report SAINTGITS COLLEGE OF APPLIED SCIENCES Report No: EA 973B 2020-21



Empaneled Accredited Energy Auditor, AEA 33 Bureau of Energy Efficiency Government of India



Empaneled Energy Auditor, EMCEEA-0211F, Energy Management Centre Government of Kerala.



Authorized Energy Auditor, GEDA/ENC/EAC: Autho/2014/8/103/2316, Gujarat Energy Development Agency Government of Gujarat



Empaneled Energy Auditor, India SME Technology Services Ltd A joint Venture of SIDBI, SBI, Indian Bank, Oriental Bank of Commerce & Indian Overseas Bank



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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" for the best performance as an Energy Auditor.

Acknowledgment

We were privileged to work together with the administration and staff of Saintgits College of Advanced Sciences 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 For OTTOTRACTIONS

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	Certification				
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	Executive	e Summary			
	Consolidated Cost Benefit Analysis of	Energy Efficie	ency Impr	ovement F	Projects
	Saintgits College of Appli	ed Sciences,	Pathamut	tom	
SI No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 257 No's T12 (55W) Lamps to 18W LED Tube	0.77	0.913	10.13	6819
2	Energy Saving by replacing existing 260 No's in-efficient ceiling fans with Energy Efficient Five-star fans	7.80	1.310	71.44	9784
3	Installation of 30kWp Solar Power Plant	16.50	5.10	38.84	38325
	Total	8.57	2.22	81,58	16603.04

(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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Introduction

A detailed energy audit has been carried out at Saintgits College of Applied Sciences, Pathamuttom by OTTOTRACTIONS in December 2021. During the energy audit energy saving opportunities has been identified to help improving energy efficiency of the facility. OTTOTRACTIONS is an Accredited Energy Auditor of Bureau of Energy Efficiency and Empaneled Energy Auditor of Energy Management Centre, Government of Kerala. The energy audit has identified energy conservation opportunities and recommended projects to improve energy efficiency of the facility.

This energy audit report complies with the clauses in *Energy Conservation Act*, 2001 on mandatory energy audit (**Form 4** [refer regulation 6(2)] guidelines for preparation of energy audit report) and complies with the G.O (Rt) No.2/2011/PD dated 01.01.2011 issued by Government of Kerala on mandatory energy audit.

1.1. General Building details and descriptions

Saintgits College of Applied Sciences is a new generation Arts and Science college launched in 2004. It has maintained high standards in academic as well as extracurricular activities ever since it launched with a full capacity of students. With a scientifically planned teaching methodology, combined with some of the best and experienced faculty and state-of-the-art infrastructure, the institute has set a benchmark in graduate studies.

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In addition to the syllabus, the institution always caters to the all-round growth of the youth and with this objective in mind we offer value-added programs. This institution is well known for campus placement and ensures higher education in esteemed national and international universities and institutes.

Occupancy Details	S
Particulars	2020-21
Total Students	1017
Staffs	54
Total Occupancy of the college	1071

For calculating specific energy consumption, the total built-up area is taken into account.

Energy audit team

The Energy Audit team is listed below. Besides this list various domine experts also participated in this project.

- 1. Suresh Babu B V, Accredited Energy Auditor, AEA 33
- 2. B. Zachariah, Chief Technical Consultant
- 3. Abin Baby, Project Engineer
- 4. Devan J, Project Engineer
- 5. Jomon J S, Project Engineer

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Process description

The energy audit has been carried out at Saintgits College of Applied Sciences. The following is the baseline data of this building.

	BASELINE DATA S	SUEET	EOD C	DEEN	ALIDIT			\neg		
1	Name of the Organisation	Saint	Saintgits College of Applied Sciences, Pathamuttom							
2	Address (include telephone, fax & e-mail)	Kotta Tel:+	Kottukulam Hills, Pathamuttom P.O, Kottayam, Pin – 686532, Kerala Tel:+91 481 2433787, +91 9544327772, Email: scas@saintgits.org							
2	Year of Establishment	2004				7				
3	Name of building and Total No. of Electrical Connections/building	Old B	uilding	, Decei	nial blo	ck				
4	Total Number of Students	Boys		Girls		Total	1017			
5	Total Number of Staff				54	10101	1011			
6	Total Occupancy				1071		-			
7	Total area of green cover				50%	//	LEGE OF APPL			
8	Type of Electrical Connection	HT	1	LT		1/3	281	3		
9	Total Connected Load (kW)		Per aren		88	SINTO		個		
10	Average Maximum Demand (KVA)				36	1 8	Mad	[]		
11	Total built up area of the building (M ²)				7400	A STATE OF THE PARTY OF THE PAR	PAULTOM, KOTTE			
12	Number of Buildings				2					
13	Average system Power Factor				1.00	()	why.			
14	Details of capacitors connected				NA			-		
15	Transformer Details (Nos., kVA, Voltage ratio)	TR 1					r K. K. Johr Principal	Control of the contro		
15	DG Set Details (kVA,)	DG1	DG2	DG3	DG4	12 D(3)	ege of Applie	Hittom D		
10	DO Get Details (KVA,)	30		A. E. Line		r ottāyan	1-686 532, 1	erala		
		Rat	ing	Nos.			marks			
16	Details of motors	5 to		3						
10	Details of Motors	10 to								
		Abov	e 50							





Energy and utility system description

3.1.1 Electricity

Electricity is purchased from KSEB under HT II (B) GENERRAL, the details are given below. A 30kVA Diesel Generator are in operation at this campus

Base line	Base line Data (Electricity Bill)					
Code	EA 973A					
Facility	Saintgits College of Applied Sciences					
Provider	KSEB					
Contract Demand (kVA)	80					
Connected Load (KW)	88					
Tariff	HT II (B) GENERAL					
Consumer Number	1346370050721					
Energy Charge Rs/ kWh Z1	6.2					
Energy Charge Rs/ kWh Z2	9.3					
Energy Charge Rs/ kWh Z3	4.65					
Demand Charge Rs/ kVA	440					
Excess Demand Rs/kVA	220					
Energy Bill Analysis interval	2020-21					

3.2. Thermal Energy / Transportation

There are six buses operated from college for transportation. LPG is used for cooking in the canteen and diesel is used to operate Diesel Generators.

> Energy Audit Report 2020-21 Saintgits college of Applied Sciences

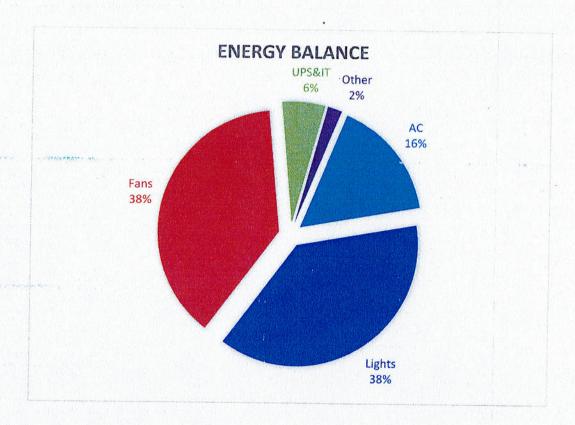


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Energy Balance



38 % of the total energy consumed in this facility is used to operate Fans. Lighting uses 38% AC uses 16%, Others uses 2% and IT Equipment uses 6%.







Performance evaluation of major utilities and process equipment's /systems.

5.1. List of equipment and process where performance testing was done.

5.1.1. Electrical System

5.1.2. Lighting & Fans

5.2. Results of performance testing

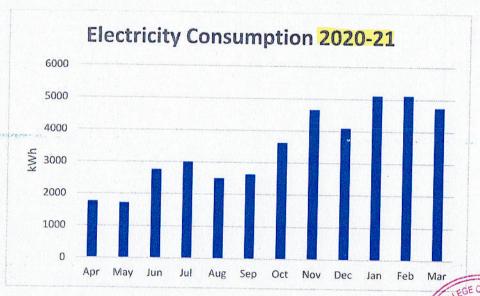
5.2.1. Electrical System

The average unit cost of electricity is **15.55Rs/kWh**. This is taken as the basis for the financial analysis of electrical energy efficiency projects. The information on average energy consumption is taken from the historical electricity bill analysis. The electricity is fed from one HT Connection.



Electricity Consumption

				Elect	ricity Bi	II Details	(2020-2	1)	STEEL STREET	NAME OF THE OWNER.			
	Name of the Consumer				Saintgits College of Applied Sciences								
Month	Contract Demand(kVA)			80 Consumer number &		1346370050721							
WOHLH	Tariff	NA - 4	HT	HT II (B)		Section			Vakat	hanam			
	kWh			kVA				PF	lanam , ,				
	Z1	Z2	Z3	Total	Z1	Z2	Z3	PF	Incentive/	Rs (Total)	Rs/kwh		
Apr	819	327	614	1760	6	6	6	1	0	38691	21.98		
May	875	294	547	1716	6	4	4	1	0	38505	22.44		
Jun	1933	289	549	2771	31	5	4	1	0	45429	16.39		
Jul	2098	315	602	3015	22	5	5	1	0	46955	15.57		
Aug	1604	308	598	2510	20	6	5	1	0	43611	17.37		
Sep	1708	312	622	2642	20	4	4	1	0	44487	16.84		
Oct	2535	401	698	3634	23	9	6	1	0	51324	14.12		
Nov	3497	417	758	4672	25	5	6	1	0	58644	12.55		
Dec	2853	422	829	4104	27	5	8	1	0	54517			
Jan	3814	438	869	5121	32	5	9	1	0		13.28		
Feb	3935	397	801	5133	36	13	18	1	0	61310	11.97		
Mar	3525	419	814	4758	30	7	10	1	0	61523 57464	11.99		



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Diesel

The campus has One Diesel Generator and one College bus set in operation. The details of Diesel consumption are given below.

	Diesel Consun	nption Details 2020-	21	
	Transportation	Generator	Total	cost
	in L	in L	in L	in Rs
20-21	3615	423	4037	375487

Annual El	ectricity Consum	ption (kWh)
Consumer No	2020-21	Connected Load (kW)
1346370050721	41836	88
Total	41836	88

	Base Line Energy Data								
	Saintgits College of Applied Sciences, Pathamuttom								
		2020-21							
1	Electricity KSEB (kWh)	41836							
2	Electricity Solar - Off grid (kWh)	0.00							
3	Electricity (KSEB + Off grid) kWh	41836							
4	Electricity Grid Tied (kWh)	6388							
5	Diesel (L)	4037							
6	LPG (kg)	0.00							
7	Biogas (m3)	0.00							

Energy Consumption Profile						
SI No	Fuel	2020-21				
		(kCal)				
1	Electricity	35978530				
2	Diesel	42393659				
3	LPG	0				
_4	Biogas	0				
LIED SC	Total	78372189				

Dr. K. K. John

Saintgits College of Applied Sciences



Solar Power Plant

Solar Power Plant

Capacity (kWp)	Annual Generation
5	6388

Lighting

	Saintgits Co	llege of	Applied	Scie	nces,	Patha	mutto	m	
SI No		Light		FAN			AC		
OFTIO		T12	LEDT	CF	EF	WF	2TR	1.5TR	1TR
1	Old building .	198	77	157			9		
2	Decennial block	59	127	103				3	1
	Total	257	204	260	0	0	9	3	1

S	aintgits College of Applied Sciences,	Pathamuttom
SI. No	Location	Avg. Lux
1	Office	89
2	Class rooms	80
3	Laboratory	90
4	Computer room	99
5	Staff rooms	87
6	Principal room	89





Energy efficiency in utility and process system

The specific energy consumption is normally taken as the ratio of total energy consumed to the total are of building.

1001110.51	OTTOTRACTIONS- ENERGY AU	DIT
	Saintgits College of Applied Sciences, Pa	athamuttom
	Energy Performance Index (EP	
SI No	Particulars	2020-21
1	Total building area (m²)	7400
2	Annual Energy Consumption (kCal)	78372189
3	Annual Energy Consumption (kWh)	91130
4	Total Energy in Toe	7.84
5	Specific Energy Consumption kWh/m²	12.31

The Energy Performance Index (EPI) is

12.31 kWh/m²

The EPI of 2020-21 may be taken as benchmark.



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Evaluation of energy management system

Energy management policy

There is no written energy policy available, but environment policy is available which includes energy conservation also. A draft energy management policy is given below. The management may constitute an energy management policy and display the same in the plant to motivate the staff.

SAINTGITS COLLEGE OF APPLIED SCIENCES ENERGY POLICY

(Draft)

We are committed to optimally utilize various forms of energy in a cost effective manner to effect conservation of energy resources. We are committed to conserve the energy which is a scarce resource with the requisite consistency in the efficiency, effectiveness in the cost involved in the operations and ensuring that production quality and quantity, environment, safety, health of people are maintained. We are also committed to increase the renewable energy share of the total energy we use.

We are also committed to monitor continuously the saving achieved and reduce its specific energy consumption by minimum of 2% every year.

Date -----

Head of the Institution

Dr. K. K. John Principal

Chintgits College of Applied Sciences ttukulam Hills, Pathamuttom P.O.



7.1. Energy management monitoring system

- Energy Management Cell has to be constituted with an objective to revise action plan for energy conservation thereby reducing the production cost.
- Energy conservation tips/ posters are displayed in crucial points.
- Use of renewable energy has to be encouraged.

7.2. Training to staff responsible for operational and Documentation.

- The staff and students need to be made more aware of the importance of energy saving and management.
- Log books shall be maintained to record Electricity Consumption and Diesel consumption.
- Meter reading shall be taken and compared with KSEB regularly.
- Better operating practices regarding appliances and fixtures should be taught to the staff.

7.3. Best Practices

- Have solid waste management program
- · Conducted Green Audit.
- Have different social and environmental clubs
- Installed LED bulbs
- Conducted Energy Conservation Training Programs
- Installed Solar Power Plant



Energy Conservation Measures and Recommendations

	Executive	Summary			
27 (0.5	Consolidated Cost Benefit Analysis of	Energy Efficie	ncy Impro	ovement P	roiects
	Saintgits College of Applie	ed Sciences,	Pathamut	tom	
SI No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 257 No's T12 (55W) Lamps to 18W LED Tube	0.77	0.913	10.13	6819
2	Energy Saving by replacing existing 260 No's in-efficient ceiling fans with Energy Efficient Five star fans	7.80	1.310	71.44	9784
3-	Installation of 30kWp Solar Power Plant	16.50	5.10	38.84	38325
	Total	8.57	2.22	81.58	16603.04

(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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OTTOTRACTIONS- ENERGY AUDIT

Energy Saving Proposal Code

Energy Saving in Lighting by replacing existing 257 No's T12 (55W) Lamps to 18W LED Tube

Existing Scenario

257 numbers of T12(55 W) lamps were identified during the energy audit field survey in the facility. During discussion with officers it is observed that the average utility of these fittings are of 30%.

Proposed System

The existing T12 may be replaced to LED Tube of 18W in phased manner and the savings will be of 67% (inclusive of improved light output and reduced energy consumption)

Financial Analysis

Annual working hours (hr)	2400
No of fittings	257
Total load (kW)	14.14
Annual Energy Consumption (kWh)	10177
Expected Annual Energy saving for replacing all fittings (kWh)	6819
Cost of Power	13.39
Annual saving in Lakhs Rs (1st year)	0.91
Investment required for complete replacements [@Rs 300 per fittings](Lakhs Rs)	0.77
Simple Pay Back (in Months)	10.13

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Energy Saving Proposal

Energy Saving by replacing existing 260 No's in-efficient ceiling fans with Energy Efficient Five star fans

Existing Scenario

There are 260 numbers of ceiling fans installed in the facility with minimum 8 hrs a day operation. All are conventional type and most of them are very old.

Proposed System

Simple Pay Back (in Months)

There is an energy saving opportunity in replace the existing fans with new five star labelled fans. The five star labelled fans give a savings up to 30% with higher service value (air delivery/watt).

Financial Analysis	
Annual working hours (hrs)	2400
Total numbers of ordinary fans	260
Total load (kW)	18.20
Annual Energy Consumption (kWh)	34944
Expected Annual Energy saving, for total replacement(kWh)	9784
Cost of Power (Rs)	13.39
Annual saving in Lakhs Rs (1st year)	1.31
Investment required for a total replacement (Lakhs Rs)[@3000 Rs per Fan with 50W at full speed]	7.80

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Energy Saving Proposal

Installation of 50kWp Solar Power Plant

Existing Scenario

There is a good potential of solar power electricity generation. The availability of sunlight is very high. There are some canopies available in the proposed site, but by having proper trimming of trees this may be avoided. If the SPVs are place in the roof top it will help improving RTTV (Roof Thermal Transmit Value) of the building.

Proposed System

It is proposed to have a Solar Power Plant of 50kW at the beginning stage. The state and central government is pushing and giving good assistance to the installation. It can be installed as an internal grid connected system which is much cheaper than off grid system. Now days the technology provides trouble free grid interactive and connected system. The installation will provide 25yrs trouble free generation with only 20% efficiency loss at the 25th year.

Financial Analysis	
Proposed Solar installed Capacity (kW)	50
Total average kWh per day expected (3.5kWh/day average)	175.00
Total annual Generating Capacity (kWh)	63875
Cost of energy generated annually Lakhs Rs	8.50
Investment required (INR lakh)(Approx)	27.50
Simple Pay Back (in Months)	38.84
Life cycle in Yrs	25
Total Saving in Life Cycle (Approx) RS lakh	OF APPL 212.38

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Hayam-686 532, K.E.



Technical Supplements

	Saintgits College of Applied Sciences, Pathamuttom	llege of	Applie	d Scie	sacue	s, Pat	hamut	tom	
ड		Lić	Light		FAN			AC	
0		T12	T12 LEDT	CF EF	出	WF	2TR	WF 2TR 1.5TR 1TR	1TR
	Old building	198	77	157			0		
7	Decennial block	59	127	103				က	-
	Total	257	204	260	0	0	6	က	-
	Wattage	55	18	80	09	55	2000	200	4000
	Power	14.14	3.67	21	0	0	18	1.5	4





Г								-								1		7	(nol) 18	
						Rs/kwh		21.98	22.44	16.39	15.57	17 27	10.11	16.84	14.12	12.55	13.28	11.97%	11.99	12 08
27 3043		uces	721	E	47.0	Rs	(lotal)	38691	38505	45429	46955	43611	1001	4448/	51324	58644	54517	61310	61523	57161
2/4	Oct Amilial O	camegica college of Applied Sciences	1346370050721	Vakathanam	L	P.F.	micentive/renaity	0	0 (0	0	C	0 0	0	0	0 0	0 (0	0	0
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v Bill D			Consumer number	& Section	kVA	72	(C	4	· u) (ဂ	9	4	6	יט ער	ט ע	o u	2 0	2 1	7
ectricit			Const	•ઇ		7.1	9	9	31	5 6	77	70	20	23	25	27	33	36	3 6	30
ū			80	HT II (B) SENERAL		Total	1760	1716	2771	7770	2010	2510	2642	3634	4672	4104	5121	5133	4750	4/28
Name of the Consumer	***	8	HT II (B) GENERAI	16y 6	Z3	614	547	549	603	700	288	622	869	758	829	869	801	217	4-0	
	ne of the		(kVA)		kWh	22	327	294	289	315	0 0	308	312	401	417	422	438	397	410	1-0
	Nan	Contract	Demand(kVA)	Tariff		17	819	875	1933	2098	1604	1004	1708	2535	3497	2853	3814	3935	3525	0700
				Month			Apr	May	Jun	Jul	Airo	Snv.	Sep	Oct	Nov	Dec	Jan	Feb	Mar	

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KERALA STATE ELECTRICITY BOARD LIMITED Office of the Special Officer(Revenue), Pattom, Thiruvananthapuram DEMAND NOTICE for MARCH 2021

						(As per	CHAPTE	R VII OF	KERA	LA ELETRI	CITYS	SUPPL	YCODE	-2014)					
Con.		-	1637005			Bill Da	e 05-M	ar-2021	I	Due Date		ar-202		Bill.No			21028	811866804 V	/er:0
_			II (B) G						ı	ast Date		ar-202		D(cash)		W. J		00 BG	
SAII PAT Kott	NTGI HAM ayam	TS UT ,,68	COLL TOM, 86532 84704	EGE	DUCATIOF APP	ONAL SO LIED SCI 6/8153	CIETY ENCE,1	3/451/	Α,	SBI Virtu Consume	al A/o	No(I	FS Code	e:SBIN007 (L)GST ID=	7049 32A	93)-K	SEBI (2277	HT16C815 NBZ1	3
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Co	ntract		75% (130% of			$\exists =$	OTTIC			20-F	ep-2021	Supply Vol			1 kV	нт	
	nd(kV/	4)	(KV		(KVA)	Charles Committee	cted Load KW)		(kVA)	Consum		LAMILA	DE	Billing Typ	e		PS		La Jacob
	30.0		60	,0,	104.0		88		7.05		218	KVVII)	1.00	Section Circle	•	100		nanam	
		97	IIV.	Reac	ling Det	ails of m	tor 161						200	Secretary 1			ottay	am	
1. Ene	ray Co	ons	umptio	n/KWh	ning Det	ails of m	ter 10	10913							or (02-20	021		
Zone		FR			IR	MF	T u	nits	Zone	ergy Cons		on(KV R					Rh (L		
1	8713	135	795.00	1	31860,00	1.000		393		1863.00		94.00	<i>MF</i> 1.000	Units	69	901	R 32,00	<i>IR</i> 89296.00	Units 83
2		_	394.00	Party.	15497.00	1.000		397	2	113.00		00.86	1.000		15	ALL CONTRACTORS	25.00	DESCRIPTION OF THE PARTY OF	38
3		303	390.00		29589.00	1.000		801		533.00		15.00	1.000		88		98.00	63141.00	65
2. Ene	ray Co	nsı	umption	n/KVAI	h)	Tota		5133		1 1/10		Total	kVArh(La	All Committee of the Co	72 k	(VArh	(Lead)	188
Zone		FR			IR	MF	116	its	4. Dei	mand (KVA)		Rea	dings		MF	_	Uni	
1		_	05.00		32048.00	1.000	- Or	3957						36.22 12.76	_	1.00			36.22
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Ave.PF	=KWh	/KV	Ah			Total		5157		ony Lightin	ng								0.0
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