ENERGY AUDIT REPORT

MAR IVANIOS COLLEGE OF ARTS AND SCIENCE

MAVELIKARA

Executed by

OTTOTRACTIONS
Energy-Engineering-Environment

2021

OTTOTRACTIONS
Energy - Engineering - Environment
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Empanelled Accredited Energy Auditor: EmAEA-33
Bureau of Energy Efficiency,
Government of India.

Empanelled Energy Auditor: EMCEEA-0211F,
EMC (Energy Management Centre-Kerala.)

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Energy Audit Report
Mar Ivanios College of Arts & Science
Report No: EA 872
2021-December

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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

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 Mar Ivanios College of Arts & Science, Mavelikara for their timely help extended to complete the audit and bringing out this report.

We thank the management of Mar Ivanios College for entrusting Ottotractions to conduct the audits in all its mentee institutes as part of its Paramarsh Scheme.

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

Contents

OTTOTRACTIONS
Energy | Engineering | Environment

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.

This Certificate is issued to Mar Ivanios College of Arts and Science , Mavelikara on their request.

Dated this 10th day of December 2021.

SURESH BABU B V
ACCREDITED ENERGY AUDITOR (AEA 33)

OTTOTRACTIONS * EMPANELED ACCREDITED ENERGY AUDITOR, BEE * AEA-0033

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

Empaneled Energy Auditor
Government of Kerala.
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Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
Mar Ivanios College of Arts and Science					
Sl No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	**Energy Saving in Lighting by replacing existing 78 No's T8 (40W) Lamps to 20 W LED Tube**	0.23	0.05	60.33	582
2	**Energy Saving in Lighting by replacing existing 7 No's CFL (20W) Lamps to 9 W LED Bulb**	0.01	0.00	34.04	28
3	**Energy Saving by replacing existing 171 No's in-efficient ceiling fans with Energy Efficient Five star fans**	4.28	0.18	277.83	2308
	Total	4.52	0.23	124.06	2917.67
(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.)					
Consolidated Cost Benefit Analysis of Renewable Energy Projects					
4	**Installation of 40kWp Solar Power Plant**	30.00	4.09	88.06	51100
5	**Installation of 15Kg/day Biogas plant**	0.2	0.26	9.39	5647
	Total	30.20	4.34	48.73	56746.80

1

Introduction

A detailed energy audit has been carried out at Mar Ivanios College of Arts and Science, Mavelikara 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

Mar Ivanios College of Arts and Science , Mavelikara is the fruition, in the fullness of time, of a cherished dream of the Servant of God Archbishop Geevarghese Mar Ivanios. The Father of the Reunion movement Mar Ivanios found education as the means to dispel the darkness of the human mind. His Grace envisaged social change brought about by imparting knowledge to all those who yearned for it. He established a series of educational institutions which serve as beacon lights across the land.

This educational institution is run by the Malankara Catholic Educational Society of the Catholic Diocese of Mavelikara under the Chairmanship of His Grace Most Rev. Dr. Joshua Mar Ignathios, the Metropolitan of the Diocese of Mavelikara, and the Chairman for CBCI Commission for Education and Culture. Set in the verdant environs of the birthplace of the saintly prelate Mar Ivanios, the college banks on the academically fertile soil of Mavelikara. The land has given birth to revered sages, sagacious statesmen, renowned scholars and acclaimed artistes. Above all it has bequeathed a secular culture of peace, progress and harmony to the people of a wide region

known as Onattukara. Mar Ivanios College envisions an intellectually empowered, ethically fortified, socially committed civil society. The academic programme of this College is scheduled for the integral development of the entire society. The thrust of this Institution is to empower the young generation. By establishing this Institution, the Diocese of Mavelikara is taking a significant step in the noble realm of higher education.

Mar Ivanios College of Arts and Science, Mavelikara is a project of the Diocese of Mavelikara which was established in Mavelikara in 2015. Mar Ivanios College of Arts and Science, Mavelikara is located very close to Mavelikara Town and Mavelikara Railway Station. The Patron of the "Mar Ivanios College of Arts and Science" is His Grace Dr. Joshua Mar Ignathios. The Director is Fr. Thomas Puthenparampil and Principal Prof. Dr. K C Mathai (Former vice Principal and HOD Physics, St. Aloysius College, Edathua). Our Departments Heads- English- Prof. Prabha Alice Varkey (Rtd. HOD Bishop moore College, Mavelikara), Commerce- Prof. Dr. Abraham Punnoose (Rtd. HOD Bishop moore College, Mavelikara) , Economics- Prof. Dr. P.K Varghese (Rtd.HOD Bishop moore College, Mavelikara).

Mar Ivanios College of Arts and Science, Mavelikara affiliated to University of Kerala conduct PG, UG degree courses in MCom. Finance and Accounting, B.A. English Language and Literature, B. A. Economics, B.Com Tax, B.Com Tourism & Travel Management, B.Com Finance. The College encompasses the best of the infrastructure, computer labs, language labs and library with internet facilities, for more international and national journal we are providing through Open Access Resources and audio visual rooms. The teaching faculty here is the best of its kind. Students are given opportunities to participate in extracurricular activities, training programme, seminars, and debates and quiz competitions. Periodical evaluation of students through internal assessments and class tests help them for the examinations.

Our highlights are: Well qualified faculty with academic repute, Campus with serene, ambience, Value based courses, Personality development programme, Club activities, Talent training programme, Playground, Tele class facility, Language lab, Counselling centre, Food Court, Hostel facility, Medicare insurance coverage, Campus recruitment coordination, Extra care for slow learners.

Occupancy Details					
Particulars	2016-17	2017-18	2018-19	2019-20	2020-21
Total Students	268	416	438	475	517
Teaching Staff	17	19	22	22	27
Non-Teaching Staff	13	13	13	13	13
Total Occupancy of the college	298	448	473	510	557

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. Ajay Dev K, Project Engineer
6. Jomon J S, Project Engineer

2

Process description

The energy audit has been carried out at Mar Ivanios Arts & Science, Mavelikara. The following is the baseline data of this building.

Form-A							
BASELINE DATA SHEET FOR GREEN AUDIT							
1	Name of the Organisation	Mar Ivanios College of Arts and Science					
2	Address (include telephone, fax & e-mail)	Mar Ivanios College of Arts and Science , Kallumala P O , Mavelikara, Pin: 690110 , ph -0479 2344601					
2	Year of Establishment	2015					
3	Name of building and total No. of Electrical Connections/building	Mar Ivanios College of Arts and Science (2)					
4	Total Number of Students	Boys	-	Girls	-	Total	475
5	Total Number of Staff	35					
6	Total Occupancy	510					
7	Total area of green cover (Acre)	5.7 Acre					
8	Type of Electrical Connection	HT	-	LT	LT-6F/Three		
9	Contract Demand (KVA) /Connection	NA					
10	Average Maximum Demand (KVA)	NA					
11	Total built up area of the building (M^2)	2440					

12	Number of Buildings	2					
13	Average system Power Factor	NA					
14	Details of capacitors connected	NA					
15	Transformer Details (Nos., kVA, Voltage ratio)	TR 1	TR 2	TR 3	TR 4	TR 5	TR 6
		NA	NA	NA	NA	NA	NA
15	DG Set Details (kVA,)	DG1	DG2	DG3	DG4	DG5	Remarks
		20	NA	NA	NA	NA	NA
16	Details of motors	Rating		Nos.		Remarks	
		5 to 10		NA		NA	
		10 to 50		NA		NA	
		Above 50		NA		NA	
17	Brief write-up about the firm and the energy/environmental conservation activities already undertaken.	Installed solar power plant, Well recharging, Tree plantation					
18	Contact Person & Telephone number	Prof. Dr. K C Mathai					
		9061202814					

3
Energy and utility system description

3.1.1 Electricity

Electricity is purchased from KSEB under LT 6F 3Phase GENERAL tariff, the details are given below. One 125 kVA Diesel Generator is in operation at this campus

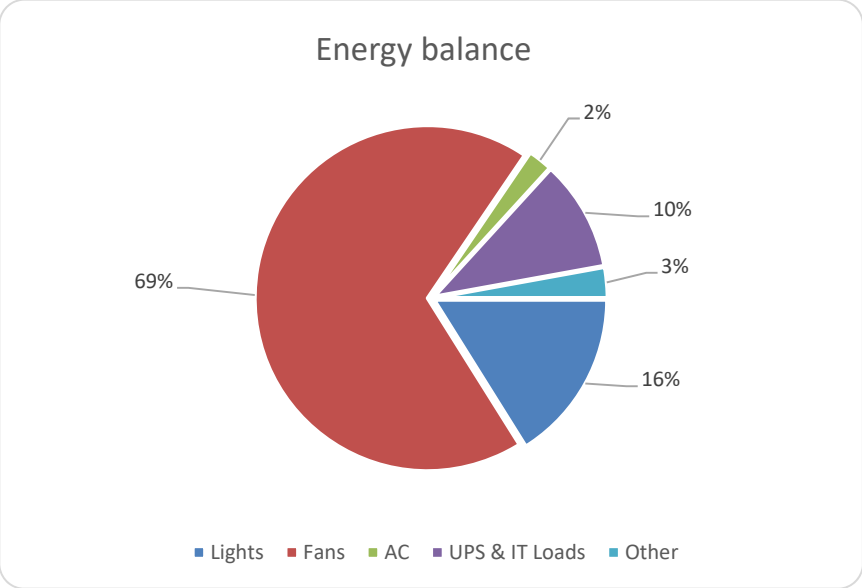
Electricity Connection Details		
Mar Ivanios College of Arts and Science		
1	Name of the Consumer	Mar Ivanios College of Arts and Science
		Kallumala
2	Tariff	LT-6F/Three
3	Consumer Numbers	1155229026811 , 1155226026331
5	Connected Load (kW)	43.4
6	Annual Electricity Consumption (kWh)	15488

3.2. Thermal Energy / Transportation

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

4

Energy Balance



69 % of the total energy consumed in this facility is used to operate Fans. Lighting uses 16% , AC and IT Equipment uses 13%.

5

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 **8.00 Rs/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 a centralized substation.

Electricity Consumption

Electricity Bill 2020-21						
Date	Cost	Fixed Charge	Energy Charge	Duty	Meter Rent	Consumption(Kwh)
Apr-20		4200	-3793.5	-421.5	15	-474.2
May-20	35494	4200				
Jun-20	21494	4200				
Jul-20	13070	4200	7969.5	885.5	15	996.2
Aug-20						
Sep-20	17370	4200	11839.5	1315.5	15	1479.9
Oct-20						
Nov-20						
Dec-20	28792	4200	22119.3	2457.7	15	2764.9
Jan-21						
Feb-21	14423	4200				
Mar-21	37455	4200	29916	3324	15	3739.5

Electricity Bill 2019-20						
Date	Amount	Fixed Charge	Energy Charge	Duty	Meter Rent	Consumption(Kwh)
Apr-18	17336	4200	11808.9	1312.1	15	1476.1
May-18	11451	4200	6512.4	723.6	15	814.1
Jun-18	7614	4200	3059.1	339.9	15	382.4
Jul-18	6192	4200	1779.3	197.7	15	222.4
Aug-18	14630	4200	9373.5	1041.5	15	1171.7
Sep-18	15152	4200	9843.3	1093.7	15	1230.4
Oct-18	22809	4200	16734.6	1859.4	15	2091.8
Nov-18	14743	4200	9475.2	1052.8	15	1184.4
Dec-18	23866	4200	17685.9	1965.1	15	2210.7
Jan-19	12272	4200	7251.3	805.7	15	906.4
Feb-19	26496	4200	20052.9	2228.1	15	2506.6
Mar-19						

Electricity Bill 2018-19						
Date	Amount	Fixed Charge	Energy Charge	Duty	Meter Rent	Consumption(Kwh)
Apr-18	15263	4200	9943.2	1104.8	15	1242.9
May-18	16460	4200	11020.5	1224.5	15	1377.6
Jun-18	7800	4200	3226.5	358.5	15	403.3
Jul-18	10589	4200	5736.6	637.4	15	717.1
Aug-18	12788	4200	7715.7	857.3	15	964.5
Sep-18	8850	4200	4171.5	463.5	15	521.4
Oct-18	14896	4200	9612.9	1068.1	15	1201.6
Nov-18	13647	4200	8488.8	943.2	15	1061.1
Dec-18	13847	4200	8668.8	963.2	15	1083.6
Jan-19	11910	4200	6925.5	769.5	15	865.7
Feb-19	12878	4200	7796.7	866.3	15	974.6
Mar-19	13665	4200	8505	945	15	1063.1

Electricity Bill 2017-18						
Date	Cost	Fixed Charge	Energy Charge	Duty	Meter Rent	Consumption(Kwh)
Apr-19	13793	4200	8620.2	957.8	15	1077.5
May-19	-	-	-	-	-	-
Jun-19	10548	4200	5699.7	633.3	15	712.5
Jul-19	31294	4200	24371.1	2707.9	15	3046.4
Aug-19	-	-	-	-	-	-
Sep-19	-	-	-	-	-	-
Oct-19	42569	4200	34518.6	3835.4	15	4314.8
Nov-19	16270	4200	10849.5	1205.5	15	1356.2
Dec-19	13760	4200	8590.5	954.5	15	1073.8
Jan-20	23360	4200	17230.5	1914.5	15	2153.8
Feb-20	-	-	-	-	-	-
Mar-20	18573	4200	12922.2	1435.8	15	1615.3

Electricity Bill 2016-17						
Date	Amount	Fixed Charge	Energy Charge	Duty	Meter Rent	Consumption(Kwh)
Apr-18	10606	6120	4023.9	447.1	15	503.0
May-18	-	-	-	-	-	-
Jun-18	10702	6120	4110.3	456.7	15	513.8
Jul-18	-	-	-	-	-	-
Aug-18	28020	6120	19696.5	2188.5	15	2462.1
Sep-18	-	-	-	-	-	-
Oct-18	26770	6120	18571.5	2063.5	15	2321.4
Nov-18	-	-	-	-	-	-
Dec-18	13943	6120	7027.2	780.8	15	878.4
Jan-19	-	-	-	-	-	-
Feb-19	13846	6120	6939.9	771.1	15	867.5
Mar-19	-	-	-	-	-	-

Observations

- PF shall be improved to unity, so that the maximum demand may be controlled.

Petrol

College has one college Bus and Mahindra TUV 500

Petrol Consumption Details		
Date	**Litre(L)**	**Cost(Rs)**
2020-21	2842.38	250130
2019-20	7105.95	625324
2018-19	3869.80	286365
2017-18	299.28	20650
2016-17	1222.39	78233

Diesel

The campus has one Diesel Generator set in operation. The details of DG is given below.

Diesel Consumption Details		
Date	**Litre(L)**	**Cost(Rs)**
2016-17	2444	141738
2017-18	2715	173779
2018-19	2386	162260
2019-20	2727	193622
2020-21	1704	131240

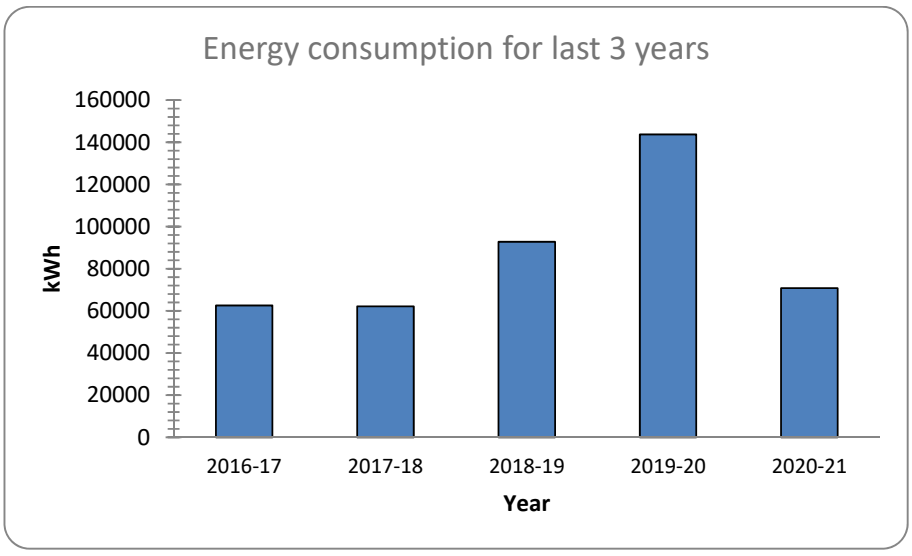
LPG

LPG Consumption Details					
	2016-17	2017-18	2018-19	2019-20	2020-21
No Cylinders	7	8	8	12	4
LPG Consumption in kg	133	152	159.6	228	76

Base Line Energy Data						
Mar Ivanios College of Arts and Science						
		2016-17	2017-18	2018-19	2019-20	2020-21
1	Electricity KSEB (kWh)	15092	23025	11476	15488	12249
2	Electricity Solar - Off grid (kWh)	0.00	0.00	0.00	0.00	0.00
3	Electricity (KSEB + Off grid) kWh	15092	23025	11476	15488	12249
4	Electricity Grid Tied (kWh)	0.00	0.00	0.00	0.00	0.00
5	Diesel (L)	2444	2715	2386.18	2727	1704

6	Petrol(L)	1222.4	299.3	3869.80	7105.95	2842.38
7	LPG (kg)	133	152	159.6	228	76
8	Biogas (kg)	0.00	0.00	0.00	0.00	0.00

Energy Consumption Profile						
Sl No	Fuel	2016-17	2017-18	2018-19	2019-20	2020-21
		(kCal)				
1	Electricity	12979400	19801871	9869758	13319414	10534264
2	Diesel	25659539	28510598	25054909	28634182	17896364
3	Petrol	13568536	3321957	42954750	78876095	31550438
4	LPG	1596000	1824000	1915200	2736000	912000
5	Biogas	-	-	-	-	-
Total (kCal)		53803474	53458426	79794617	123565691	60893066



6

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.

OTTOTRACTIONS- ENERGY AUDIT						
Mar Ivanios College of Arts and Science						
Energy Performance Index (EPI)						
Sl No	Particulars	2016-17	2017-18	2018-19	2019-20	2020-21
1	Total building area (m^2)	2440	2440	2440	2440	2440
2	Annual Energy Consumption (kCal)	53803474	53458426	79794617	123565691	60893066
3	Annual Energy Consumption (kWh)	62562.2	62161.0	92784.4	143681.0	70805.89
4	Total Energy in Toe	5.38	5.35	7.98	12.36	6.09
5	Specific Energy Consumption kWh/m^2	25.64	25.48	38.03	58.89	29.02

The Energy Performance Index (EPI)is

58.89 kWh/m^2

This may be due to the lesser occupancy during pandemic shut downs, so the benchmark year may be taken as 2019-20. All the proposals for energy savings are prepared based on the data during 2019-20.

7

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.

Mar Ivanios College of Arts & Science

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

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

8

Energy Conservation Measures and Recommendations

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code EA 872.01	
Energy Saving in Lighting by replacing existing 78 No's T8 (40W) Lamps to 20 W LED Tube	
Existing Scenario	
78 numbers of T8(40 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 T8 may be replaced to LED Tube of 20 W 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)	1480
No of fittings	78
Total load (kW)	3.12
Annual Energy Consumption (kWh)	924
Expected Annual Energy saving for replacing all fittings (kWh)	582
Cost of Power	8.00
Annual saving in Lakhs Rs (1st year)	0.05
Investment required for complete replacements [@Rs 300 per fittings](Lakhs Rs)	0.23
Simple Pay Back (in Months)	60.33

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code EA 872.02	
Energy Saving in Lighting by replacing existing 7 No's CFL (20W) Lamps to 9 W LED Bulb	
Existing Scenario	
7 numbers of CFL(20 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 CFL may be replaced to LED Bulb of 9 W 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)	1480
No of fittings	7
Total load (kW)	0.14
Annual Energy Consumption (kWh)	41
Expected Annual Energy saving for replacing all fittings (kWh)	28
Cost of Power	8.00
Annual saving in Lakhs Rs (1st year)	0.00
Investment required for complete replacements [@Rs 90 per fittings](Lakhs Rs)	0.01
Simple Pay Back (in Months)	34.04

Energy Saving Proposal Code EA 872.03	
Energy Saving by replacing existing 171 No's in-efficient ceiling fans with Energy Efficient Five star fans	
Existing Scenario	
There are 171 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	
Financial Analysis	
Annual working hours (hrs)	1480
Total numbers of ordinary fans	171
Total load (kW)	13.68
Annual Energy Consumption (kWh)	6074
Expected Annual Energy saving, for total replacement(kWh)	2308
Cost of Power (Rs)	8.00
Annual saving in Lakhs Rs (1st year)	0.18
Investment required for replacing Fans (Lakhs Rs)[@2500 Rs per Fan for 5 Star Labelled Fans with service value above 6]	4.28
Simple Pay Back (in Months)	277.83

Energy Saving Proposal Code 872.04	
Installation of 40kWp 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 40kWp 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)	40
Total average kWh per day expected (3.5kWh/day average)	140.00
Total annual Generating Capacity (kWh)	51100
Cost of energy generated annually Lakhs Rs	4.09
Investment required (INR lakh)(Approx)	30.00
Simple Pay Back (in Months)	88.06
Life cycle in Yrs	25
Total Saving in Life Cycle (Approx) RS lakh	102.20

Sl.no	Installation of 15Kg/day Biogas plant	
1	Capacity of Bio gas plant(Kg/day)	15
2	Average Calorific Value of biogas (kCal/m3)	3500
3	Annual Generation of Biogas Plant	1387.5
4	Daily production of biogas (kCal)	26250
5	LPG Saving in a day (kg)	2.1875
6	Annual LPG Saving (Kg)	405
7	Investment required (in Lakhs)	0.2
8	Annual Cost saving (in Lakhs)	0.26
9	Expected Annual Energy saving (kWh)	5647
10	Simple Pay Back (In Months)	9.39

Mar Ivanios College of Arts and Science						
Greenhouse Gas Mitigation through Major Energy Efficiency Projects						
Sl No	Projects	Energy saved(Yearly)		Sustainability (Years)	First year ton of CO_2 mitigated	Expected Tons of CO_2 mitigated through out life cycle
		(kWh)	MWh	Years		
1	Energy Saving in Lighting by replacing existing 78 No's T8 (40W) Lamps to 20 W LED Tube	582	0.58	10	0.46	4.60
2	Energy Saving in Lighting by replacing existing 7 No's CFL (20W) Lamps to 9 W LED Bulb	28	0.03	10	0.02	0.22
3	Energy Saving by replacing existing 171 No's in-efficient ceiling fans with Energy Efficient Five star fans	2308	2.31	10	1.82	18.23
Total		**2918**	**3**	**10**	**2.30**	**23**

Technical Supplements

Sl.No		Location	LIGHT				FAN	IT		AC
			T8	CFL	LED BULB	LED TUBE	CF	PC	Printer	1.5
1	Second Floor	Class 307				6	5			
2		308				6	5			
3		306				6	5			
4		304				6	5			
5		303				6	5			
6		302				6	5			
7		301				6	5			
8		Class 1				6	5			
9		Class 2				6	5			
10		Staff Room				5	4			
11		Department				4	4			
12		Yoga Corner				7	4			
13	First Floor	201	4				5			
14		202	4				5			
15		Department	6			1	4			
16		203	4				5			
17		IQ NC	4				4			
18		Office	4		1	2		4		
19		205	4				5			
20		Principal	3	1	1	2	4			1

21		207	1		1	1	5			
22		Computer Lab	9	4			6	45		
23		208	2	2	3	2	5			
24	Ground Floor	106	4				5			
25		107	4				5			
26		108	4				5			
27		Library	4		3	3	2	1	1	
28		Department	1			1	5	3		
29		104	2				2			
30		Seminar Hall	2			3	10			
31		**101**	4							
32		102	4							
33		103	4							
34		Canteen				2	5			
35	HOSTEL	27 Room				27	27			
		TOTAL	**78**	**7**	**9**	**114**	**171**	**53**	**1**	**1**