ENERGY AUDIT REPORT

VTM NSS COLLEGE

DHANUVACHAPURAM

OTTOTRACTIONS
Energy - Engineering - Environment

DNRA 170, Valiyavila, Thirumala P O, Thiruvananthapuram 695006
Ph/Fax:0471 3966250,2368747 Helpline: +919447068747, 9447621674,
email:ottotractions@email.com, otenergy@gmail.com
www.ottotractions.com

Executed by

OTTOTRACTIONS
Energy-Engineering-Environment

2023

Accredited Energy Auditor: AEA-33
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

VTM NSS College, Dhanuvachapuram

Report No: EA 1086
2023

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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. Ottotractions is an ISO 9001-2015, ISO 17020-2012 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 VTM NSS College, Dhanuvachapuram. We are grateful to them for the 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.

For OTTOTRACTIONS

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

Contents

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)
BUREAU OF ENERGY EFFICIENCY
GOVERNMENT OF INDIA

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
VTM NSS College, Dhanuvachapuram					
Sl No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 3 No's T8 (40W) Lamps to 18W LED Tube	0.01	0.005	22.85	63
2	Energy Saving in Lighting by replacing existing 7 No's T12 (55W) Lamps to 18W LED Tube	0.02	0.01	18.19	186
3	Energy Saving by replacing existing 123 No's in-efficient ceiling fans with Energy Efficient Five star fans	3.69	0.17	256.47	2314
4	Installation of 15kWp Solar Power Plant	8.25	2.731	36.26	20531
	Total	**11.97**	**2.92**	**83.44**	**23095**
(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 VTM NSS College by OTTOTRACTIONS in December 2023. 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.

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

The Nair Service Society established VTM-NSS College in 1964 in commemoration of the great freedom fighter, Thalakulathu Velu Thampi Dalava, on the occasion of his 200th birth anniversary.VTMNSS College is situated on a hillock at Dhanuvachapuram, en route to Kanayakumari, which is on the southernmost tip of Kerala. The idyllic environs of the college provide a congenial ambience for academic pursuits.The college started off modestly as a junior college on July 15, 1964 in a temporary building and has now developed into a full- fledged first grade college. It was upgraded in 1967 with the commencement of Degree Courses in

English, History, Politics Science, Mathematics, Physics, Chemistry, and Commerce. Degree Courses in Economics and Botany were started in 1981.

Degree courses in Zoology and Malayalam were introduced in 1984 and 1995 respectively. The college attained the status of a first grade college when the Post Graduate course in Commerce was begun in 1981 followed by the Post Graduate course in English in 1998 and History in 1999.The college scaled great heights despite the impediments that generally come in the way of a college in a rural backdrop. More than 80 per cent of the students come from financially challenged families of peasants, fishermen, coolies and people engaged in the unorganized traditional sectors like handloom weaving, masonry and pottery making. Their only means of sustenance in education is the fee concession allowed by the State Government and a few scholarships.

Occupancy Details					
Particulars	2018-19	2019-20	2020-21	2021-22	2022-23
Total Students	1739	1757	1675	1832	1746
Staffs	62	61	60	62	58
Total Occupancy of the college	1801	1818	1735	1894	1804

For calculating specific energy consumption, the total built-up area is considered.

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. Jomon J S, Project Engineer
5. Vishnu S S, Project Engineer
6. Reshma, Data Analyst
7. Anjana B S, Project Assistant

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Process description

The energy audit has been carried out at VTM NSS College, Dhanuvachapuram. The following is the baseline data of this building.

BASELINE DATA SHEET FOR GREEN AUDIT												
1	Name of the Organisation	VTM NSS College, Dhanuvachapuram										
2	Address (include telephone, fax & e-mail)	VTM NSS College Dhanuvachapuram, Thiruvananthapuram, Kerala-695503 0471-223 2240 principal@vtmnsscollege.ac.in										
3	Year of Establishment	1964										
4	Name of building and Total No. of Electrical Connections/building	NSS College (5)										
5	Total Number of Students	Boys	-	Girls	-	Total	1746					
6	Total Number of Staff	58										
7	Total Occupancy	1804										
8	Total area of green cover	50%										
9	Type of Electrical Connection	HT	0	LT	5							
10	Total Connected Load (kW)	70										
11	Average Maximum Demand (KVA)	-										
12	Total built up area of the building (M^2)	4524.73										
13	Number of Buildings	4										
14	Average system Power Factor	0.99										
15	Details of capacitors connected	Nil										
16	Transformer Details (Nos., kVA, Voltage ratio)	TR 1										
		0										
17	DG Set Details (kVA)	DG1	DG2	DG3	DG4	DG5	Remarks					
		30										
18	Details of motors	Rating			Nos.			Remarks				
		5 to 10			2							
		10 to 50										
		Above 50										

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Energy and utility system description

3.1.1 Electricity

Electricity is purchased from KSEB under five LT Connections, the details are given below.

Electricity Connection Details		
VTM NSS College, Dhanuvachapuram		
1	Name of the Consumer	VTM NSS College, Dhanuvachapuram
2	Tariff	LT-6A/Ndom
3	Consumer Numbers	1145383023343, 1145384000482 1145382000488, 1145386000487 1145388000570
4	Connected Load Total (kW)	70
5	Annual Electricity Consumption (kWh)	23260

3.2. Thermal Energy / Transportation

No bus is operated from college for transportation. LPG is used for cooking in the canteen and diesel is used to operate Diesel Generators.

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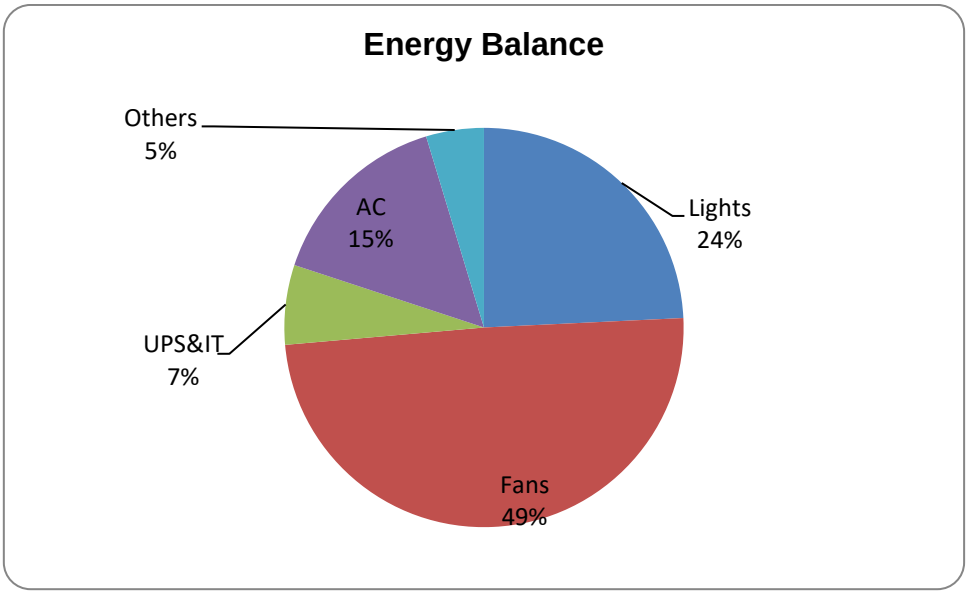
Energy Balance



Fans account for 49% of the overall energy consumption in this facility, while lighting utilizes 24%, UPS and IT contribute7% and other miscellaneous uses constitute 5%. Additionally, 15% of the total energy is consumed by air conditioning systems.

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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 **7.46 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.

Electricity Consumption

Year	18-19	19-20	20-21	21-22	22-23
CONSUMER NO	1145383023343				
APR	4409	4680		3163	3871
JUN	2659	3009	4486	3086	3145
AUG	2739	4743		861	2760
OCT	2768	3972	2504	2454	2697
DEC	3158	3564	3025	2215	3683
FEB		3184	3841	2215	3802

Year	18-19	19-20	20-21	21-22	22-23
CONSUMER NO		1145384000482			
APR	3053	5088			4345
JUN	1621	2140	5852		1494
AUG	3704	26293	2723	3968	3351
OCT	3208	8267	609	817	3108
DEC	8894	8267	671	1613	4034
FEB	4525	8267	2729	2884	3829

Year	18-19	19-20	20-21	21-22	22-23
CONSUMER NO		1145382000488			
APR	1263	2339		2229	2811
JUN	1836	3743	3791	1721	2418
AUG	718	2785	1481	778	3452
OCT	2061	2392	1376	1977	4054
DEC	3667	2630	1071	2505	4246
FEB	3004	2975	2205	2222	4954

Year	18-19	19-20	20-21	21-22	22-23
CONSUMER NO		1145386000487			
APR	3958	2252		2963	2279
JUN	5661	1557	3396	1954	1980
AUG	3172	2068	1725	922	22225
OCT	3074	2305	1683	1765	2317
DEC	2603	2318	1829	3763	2832
FEB	3280		1955	2580	2947

Year	18-19	19-20	20-21	21-22	22-23
CONSUMER NO		1145388000570			
APR	21317	31197	7946	12174	13501
JUN	19767	19627	995	3419	15044
JUL				5817	10338
AUG	20920	23922	7677	8327	9586
SEP				6439	12025
OCT	19214	27629	10597	7612	8346
NOV		14429	2980	7905	10778
DEC	22237	10951		9978	10338
JAN		10,397		9277	13234
FEB	25307	111,87	9658	12142	9519

Base Line Energy Data						
VTM NSS College, Dhanuvachapuram						
		2018-19	2019-20	2020-21	2021-22	2022-23
1	Electricity KSEB (kWh)	22644	28702	11240	15604	23260
2	Electricity DG (kWh)	825	841	859	876	894
3	Electricity Solar , Off grid (kWh)	1473	1503	1534	1565	1597
4	Electricity (KSEB + DG + Off grid) kWh	24942	31047	13633	18045	25751
5	Electricity Grid Tied (kWh)	5892	6012	6135	6260	6388
6	Diesel (L)	274.87	280.48	286.20	292.04	298.0
7	LPG (kg)	319.20	243.00	180.00	225.00	270.00
8	Biogas generated/year (kg)	0.00	0.00	0.00	0.00	0.00

Energy Consumption Profile						
Sl No	Fuel	2018-19	2019-20	2020-21	2021-22	2022-23
		kCal				
1	Electricity	21449789	26700279	11724010	15518749	22146039
2	Diesel	2886090	2944990	3005092	3066420	3129000
3	LPG	3830400	2916000	2160000	2700000	3240000
4	Biogas	0	0	0	0	0
Total		28166279	32561269	16889102	21285169	28515039

Lighting

Sl.No	Location	Lights						
		LED-T	LED-B	LED-SQ	LED(10W)	LED(200W)	T8	T12
1	Classroom×4	4						
2	Classroom×3	18	6					
3	Computer Lab	7						2
4	Principal	4			10			
5	PG Staffroom	2						
6	Dept of Botany	2						
7	Classroom	5						1
8	Office	11					1	2
9	Guest Room	2						
10	Dept of History Lecture Classroom	2						
11	Staff room	2						
12	Bsc Botany Lab	4						
13	Pg Dept of English	2						
14	Physical Education Dept	2						
15	6 Classrooms	12						
16	Malayalam Dept	3						
17	Dept of Maths	2						
18	Classroom	1						
19	Seminar Hall			15				
20	MA History Class	2						
21	3 Classrooms	12						
22	HOD Physics	2						
23	Physics Dept	2						
24	3 Lab	12						
25	Dept of English lab	2						
26	Classroom	4						
27	Chemistry Lab	4						
28	2 Classroom	8						
29	HOD Chemistry	1						
30	Dept of Chemistry	1						
31	Canteen		4				2	
32	Commerce & Economics Block	4						
33	Classroom	3						
34	Classroom BA Economics	3						
35	II BA Economics×2	4						
36	Bcom Classroom	1						

37	Mcom Classroom	2						
38	2 Bcom Classrooms	4						
39	PG Commerce Dept	2						
40	Commerce HOD	1						
41	Library	2						
42	Mcom Ist &2nd Sem Class	3						
43	Solar					5		
44	NSS							2
	Total	**164**	**10**	**15**	**10**	**5**	**3**	**7**

Lux Measurement

Sl.No	Location	Avg
1	Computer Lab	164
2	Principal	88
3	PG Staffroom	123
4	Dept of Botany	97
5	Classroom	123
6	Office	125
7	Guest Room	133
8	Dept of History Lecture Classroom	111
9	Staff room	126
10	Bsc Botany Lab	125
11	Pg Dept of English	123
12	Physical Education Dept	125
13	Malayalam Dept	88
14	Dept of Maths	97
15	Classroom	123
16	Seminar Hall	125
17	MA History Class	133
18	HOD Physics	126
19	Physics Dept	125
20	Dept of English lab	125
21	Classroom	164
22	Chemistry Lab	88
23	HOD Chemistry	123
24	Dept of Chemistry	125
25	Canteen	133
26	Commerce & Economics Block	111

27	Classroom	126
28	Classroom BA Economics	125
29	II BA Economics×2	123
30	Bcom Classroom	125
31	Mcom Classroom	164
32	PG Commerce Dept	97
33	Commerce HOD	123
34	Library	125
35	Mcom Ist &2nd Sem Class	133
36	NSS	126

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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						
VTM NSS College, Dhanuvachapuram						
Energy Performance Index (EPI)						
Sl No	**Particulars**	2018-19	2019-20	2020-21	2021-22	2022-23
1	Total building area (m^2)	4524.73	4524.73	4524.73	4524.73	4524.73
2	Annual Energy Consumption (kCal)	28166279	32561269	16889102	21285169	28515039
3	Annual Energy Consumption (kWh)	32751	37862	19638	24750	33157
4	Total Energy in Toe	2.82	3.26	1.69	2.13	2.85
5	Specific Energy Consumption kWh/m^2	7.24	8.37	4.34	5.47	7.33

The Energy Performance Index (EPI) is

7.33 kWh/m^2

The EPI of 2022-23 may be taken as benchmark.

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.

VTM NSS COLLEGE,
DHANUVACHAPURAM

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
- Installed Solar Street Lights in the campus
- Conducted Energy Conservation Training Programs
- Installed Biogas plant in the campus

8

Energy Conservation Measures and Recommendations

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
VTM NSS College, Dhanuvachapuram					
Sl No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 3 No's T8 (40W) Lamps to 18W LED Tube	0.01	0.005	22.85	63
2	Energy Saving in Lighting by replacing existing 7 No's T12 (55W) Lamps to 18W LED Tube	0.02	0.01	18.19	186
3	Energy Saving by replacing existing 123 No's in-efficent ceiling fans with Energy Efficient Five star fans	3.69	0.17	256.47	2314
4	Installation of 15kWp Solar Power Plant	8.25	2.731	36.26	20531
	Total	**11.97**	**2.92**	**83.44**	**23095**
(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.)					

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal	
Energy Saving in Lighting by replacing existing 3 No's T8 (40W) Lamps to 18W LED Tube	
Existing Scenario	
3 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 18W in phased manner and the savings will be of 55% (inclusive of improved light output and reduced energy consumption)	
Financial Analysis	
Annual working hours (hr)	2400
No of fittings	3
Total load (kW)	0.12
Annual Energy Consumption (kWh)	115
Expected Annual Energy saving for replacing all fittings (kWh)	63
Cost of Power	7.46
Annual saving in Lakhs Rs (1st year)	0.00
Investment required for complete replacements [@Rs 300 per fittings](Lakhs Rs)	0.01
Simple Pay Back (in Months)	22.85

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal	
Energy Saving in Lighting by replacing existing 7 No's T12 (55W) Lamps to 18W LED Tube	
Existing Scenario	
7 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	7
Total load (kW)	0.39
Annual Energy Consumption (kWh)	277
Expected Annual Energy saving for replacing all fittings (kWh)	186
Cost of Power	7.46
Annual saving in Lakhs Rs (1st year)	0.01
Investment required for complete replacements [@Rs 300 per fittings](Lakhs Rs)	0.02
Simple Pay Back (in Months)	18.19

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal	
Energy Saving by replacing existing 123 No's in-efficent ceiling fans with Energy Efficient Five star fans	
Existing Scenario	
There are 123 numbers of ceiling fans installed in the facilty with minimum 8 hrs a day operation. All are conventional type and most of them are very old.	
Proposed System	
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	123
Total load (kW)	8.61
Annual Energy Consumption (kWh)	8266
Expected Annual Energy saving, for total replacement(kWh)	2314
Cost of Power (Rs)	7.46
Annual saving in Lakhs Rs (1st year)	0.17
Investment required for a total replacement (Lakhs Rs)[@3000 Rs per Fan with 50W at full speed]	3.69
Simple Pay Back (in Months)	256.47

Energy Saving Proposal	
Installation of 15kWp 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 35kW 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)	15
Total average kWh per day expected (3.5kWh/day average)	56.25
Total annual Generating Capacity (kWh)	20531
Cost of energy generated annually Lakhs Rs	2.73
Investment required (INR lakh)(Approx)	8.25
Simple Pay Back (in Months)	36.26
Life cycle in Yrs	25
Total Saving in Life Cycle (Approx) RS lakh	68.27

Technical Supplements

VTM NSS College, Dhanuvachapuram																	
Sl.No	Location	Lights							Fans		IT			AC		Others	
		LED-T	LED-B	LED-SQ	LED(10W)	LED(200W)	T8	T12	CF	WF	Printer	Projector	PC	2Tr	1.5 TR	TV	Freezer
1	Classroom×4	4							4								
2	Classroom×3	18	6						12								
3	Computer Lab	7						2		4		1	45				
4	Principal	4			10				1	2	1	1	1		1	1	
5	PG Staffroom	2							2								
6	Dept of Botany	2							2								
7	Classroom	5						1	2			1					
8	Office	11					1	2	7		2		7				
9	Guest Room	2													1		
10	Dept of History Lecture Classroom	2							3								
11	Staff room	2							2								
12	Bsc Botany Lab	4							2			1					
13	Pg Dept of English	2							2								
14	Physical Education Dept	2							1								
15	6 Classrooms	12							6								
16	Malayalam Dept	3							2								
17	Dept of Maths	2							2								
18	Classroom	1							1								

19	Seminar Hall			15						8		1		4			
20	MA History Class	2							2								
21	3 Classrooms	12							9								
22	HOD Physics	2							1				1				
23	Physics Dept	2							1								
24	3 Lab	12							6								
25	Dept of English lab	2							1								
26	Classroom	4							2								
27	Chemistry Lab	4							3								
28	2 Classroom	8							6								
29	HOD Chemistry	1							1								
30	Dept of Chemistry	1							1								
31	Canteen		4				2		6								1
32	Commerce & Economics Block	4							2								
33	Classroom	3							2								
34	Classroom BA Economics	3							3								
35	II BA Economics×2	4							4								
36	Bcom Classroom	1							5								
37	Mcom Classroom	2							2								
38	2 Bcom Classrooms	4							4								
39	PG Commerce Dept	2							3								
40	Commerce HOD	1							1								
41	Library	2							3								
42	Mcom Ist &2nd Sem Class	3							2								
43	Solar					5											
44	NSS							2	2								
	Total	**164**	**10**	**15**	**10**	**5**	**3**	**7**	**123**	**14**	**3**	**5**	**54**	**4**	**2**	**1**	**1**