

**ENERGY AUDIT
CONDUCTED
AT**

Shri R.K. Parikh Arts and Science College, Petlad



P.O. Box No 23 , Petlad on Feb 2021

Under Provisions of Energy Conservation Act 2001.

Consumer No – 01103020447

Conducted By



Green Energy Audit

Green Energy Audit

Green House -B-20 Asha Lata Park ,Kamla Nagar,Ajwa Road, Baroda 390 019

Email: contact@greenenergyaudit.in

Web-www.greenenergyaudit.in



GUJ/0013

GOVERNMENT OF GUJARAT

AUTHORISATION FOR ENERGY AUDIT

(Under Clause -4 (2) (a) of Government Order E & P.C. Deptt.
No.GHU/99/31/GUE/1196/9018/K1 Dated 5th October, 1999)

Shri / M/s M/s GREEN ENERGY AUDIT ,, BARODA is/are
hereby granted authorization to carry out the energy audit in the
State of Gujarat as required under clause 3 of the Government
order Energy and Petrochemicals Department No.GHU/99/31/
GUE/1196/9018/K1 Dated 5th October, 1999.

(Sd/-)

Office of the Chief Electrical Inspector
Udyog Bhavan, Block No.18, 6th Floor,
Sector-11, Gandhinagar.

Chief Electrical Inspector
Gujarat State

Date of issue: 17-Jul-2012



Date of renewal	Date of expiry	C.E.I'S Initials	Date of renewal	Date of expiry	C.E.I's Initials
---	16/07/2003	Sd/-	17/07/2009	16/07/2012	Sd/-
17/07/2003	16/07/2006	Sd/-	17/07/2012	16/07/2015	
17/07/2006	16/07/2009	Sd/-	17/7/2018	16/7/2021	

Acknowledgement

1 M/s, Green Energy Audit are thankful to the Management of Shri RK Parikh College who have provided valuable co-operation and guidance to our audit team during the course of site visit and measurements. We are also thankful to all those who gave us the necessary inputs and information to carry out this very vital exercise of energy audit specifically Dr. Vimal Joshi (Principal) , Shri Kalpesh Trivedi (Faculty & Coordinator) and Shri Pritesh Bhai (Electrician) as a team whose dynamic interference and zeal to carry out energy audit has helped us for the ground work done at the institute. We also appreciate the best efforts put in by them for carrying out energy audit and also to their interest to implement some of the measures readily in the plant.

1.1 At last we are thankful from our bottom of the heart to all the staff members who were directly and indirectly involved in collecting the data and conducting field measurements.

This being a mandatory energy audit, and the results can be sent to the Government office, the report is being prepared according to requirement of Government and to cover the topics framed under Indian Energy conservation act -2001 as well as the NAAC requirements.

Sr No	Auditors Name	Registration no.	Sign
1	Shri Vijay Kumar	EA-10184	
2	Shri Brahma Prakash	EA- 16342	

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Schedule of Measures Suggested during Energy Audit at College

- 1) The Annual Monetary savings of Rs 42,048 can be achieved by running water pumps at Off –peak hours with a total load of 50 HP. **(Page-9)**
- 2) The Annual Monetary savings of Rs 3024 & Unit savings of 432 units can be achieved by replacing incandescent bulbs with LED lamps **(Page-10)**
- 3) As per the Load Analysis of Auxiliary loads & new Building, The New building connected load can be taken as 40 HP as for new connection with Discom (MGVCL).GLP Tariff structure to be used in connection. **(Page-11)**
- 4) As per Load analysis, the sports room demanded load is 4 HP , however requirement presently is 1.2 HP and henceforth more electrical loads can be added to the sports room. **(Page-11)**
- 5) The Annual Monetary savings of Rs 18,816 & Unit savings of 2688 units can be achieved by replacing 56 nos of Tube lights with LED lamps. **(Page-12)**
- 6) The Annual Monetary savings of Rs 84,890 & Unit savings of 12,127 units can be achieved by replacing 163 nos of Ceiling Fans with Energy Efficient BLDC Fans. **(Page-13)**
- 7) Solar Capacity installation of 15 kw with net metering can provide free energy to the campus with a Payback time period of 3.1 Years. **(Page-14)**

Room Wise- Equipment list											
Room no	Tube	LED	Bulb	Fan	AC	Projector	Computer	Fridge	RO	tv	other
1	2	2		3	2 ton			1(210 L)		1	
2	7			4			4				
3	2			2							500 watt(Pad machine)
4		2		5		1					
5		9		8							furnace 3 kw
6	1			1		1					
7		7		4	1.5 ton			1(210 L)			
8		2		4							500 watt
9	1	1					2				
10		6		4							
11					2 ton						
12	4			3							300 w server
13		2		5		1					
14	6			4							
15	2			2							
16	1			3			2	1 (300L)			
17		4		4							Oven-1(300 W)
18		6		5							
19	2	2	200x2	1							
20	1								1(300 L)		Water Cooler (1000 W)
21		1									
22	8			9							
23		2		3							
24		2		4							
25		20		12			1				
26	2			1							
27		4		5							
28		6		7		1					
29	1			3		1					
30	1			2							
31		10		6	2tonX2	1					
32	2			4							
33	1			5							
34	1			4							
35		4		5		1					
36		19		9			1				
37		4		4							
38	1			4		1					
39	4			4			1	1(210 L)			
40		3		5			1	1 (300L)			Autoclave -9 KW
41	6			5							Incubator-200 W
Lobby		8									
TOTAL	56	126	2	163	5	8	12	5	0	1	0

Energy Analysis

Energy Analysis- College						
Sr nos	Device	Nos	Watts	Usage Per Day(Hrs)	KW Load	Average KWH per Day
1	LED /CFL Bulbs	126	18	4	2.268	0.072
2	Incandescent Bulbs	2	200	4	0.4	0.8
3	Tube Lights	56	50	4	2.8	0.2
4	Fans	163	90	4	14.67	0.36
5	Airconditioner	4	2400	3	9.6	7.2
6	Airconditioner	1	1800	3	1.8	5.4
7	300 Liter RO Machine	1	1500	1	1.5	1.5
8	Computer	12	300	5	3.6	1.5
9	Projector	8	350	2	2.8	0.7
10	Refrigerator	5	1000	10	5	10
				TOTAL	44.438	27.732
				IN HP	59.54692	

The Energy Analysis of college is done by observation of actual demand and the connection load taken from MGVCCL.

The Full load in the condition of all equipment's running is 44 kw which is practically not the case. The 40 kw load presently taken is ok as reducing the load would not reduce the fixed charges by MGVCCL as the connection already comes in the GLP Tariff.

The GLP tariff is already subsidized tariff structure for educational and research institutions under Govt of Gujarat.

As the Tariff Connection is already subsidised, further reduction in load or installation of capacitors bank on the main panel is not going to give any further energy savings , which become applicable only if there is a change in load structure or the tariff plans.

Further as there is no penalty for low Power factor is levied by Discom , it is not required to install capacitor banks on main panel.

Energy savings by Opting for Time of Use Discount

The Annual Monetary savings of Rs 42,048 can be achieved by running water pumps at Off –peak hours with a total load of 50 HP.

Presently the College runs 10 Hp Submersible Water pump for Purpose of Drinking water supply to the Premises. The Present Tariff plan is WWSP (Type-1) as per Page 17 Mgvcl Tariff Order.

As the more water demand for New College building is envisaged. To take benefit of Time of Use charges in Tariff Structure Following measures can be taken in future:

- Increase demand up to 50 hp
- Run the Submersible Pumps and motors at Off Peak Hours ie between 11 am- 6 pm & 10 pm-6 am.

As the Time of Use Discount the Tariff Charges are 40 Paise per Unit as compared to the Present 430 Paise per Unit. The increase in fixed charge for 50 hp load will be only Rs 1000 per month.

Reference -Mgvcl tariff circular no -2020-21/P-1841/123 Dated 15/04/2020

Time Of Use Discount (WW PR Tariff)				Fixed Charge Expense	
		As per Feb 2021 Bill	(in Rs)	Fixed Charge as per Tariff	Rs 25 Per HP
Present Unit Tariff	430 paise per unit	1155 units	4966.5	Present Fixed Charge(For 10 Hp Load)	250
Future Unit Tariff	40 paise per unit	1155 units	462	Fixed charge for 50 hp (Future tariff)	1250
	Gross Monthly Savings (In Rs)		4504.5	Monthly Increase (In Rs)	1000
	Gross Annual Savings (In Rs)		54054	Net Monthly Savings (In Rs)	3504
				Net Annual Savings (In Rs)	Rs 42,048

Energy savings by replacing Incandescent bulbs with LED lamps

The College uses two incandescent bulbs in room no 19 as per the observations made. The incandescent bulbs waste 80% of their energy as Heat and only 20 % is used as light. Replacing these incandescent bulbs with LED impart as annual Monetary savings of Rs 3024 & units as 432 units.

Replace 200 Watt Incandescent Bulb with 20 Watt LED Lamps.			
Luminair type	Nos.	Actual Wattage	Total
Incandescent Bulb	2	200 watt	0.4 kw
LED	2	20 watt	0.040 kw
Savings in KW			0.36 kw
For 4 hrs, kwh (From 11 am to 3 pm)			1.44 kwh
Savings in Kwh/Annum	300 days working		432 kwh
Savings @7 Rs.per kwh (Per Unit price)			Rs 3024
Investment @ 200 Rs.	2		Rs 400
Payback period in Months			2 Months

Also heat dissipation can be avoided for the same.

Load Analysis- Auxilliary Loads

LOAD ANALYSIS -COLLEGE AUXILLIARY LOADS													
	NEW BUILDING FOR MA DEGREE			SPORTS ROOM			SINGLE PHASE (Room no 11)			MOTOR ROOM			
Equipments	Number of Equipments Proposed	Load Profile (W)	kw Load	Number of Equipments Present	Load Profile (W)	kw Load	Number of Equipments Present	Load Profile (W)	kw Load	Number of Equipments Present	Load Profile (W)	kw Load	
LED	113	10	1.13	20	20	0.4	7	10	0.07				
Fan	54	40	2.16	7	70	0.49	4	70					
AC	3	2400	7.2										
Projector	5	350	1.75				1	350	0.35				
Computer	35	300	10.5				24	300					
Refrigerator	1	1000	1										
ro machine	1	1500	1.5										
tv	1	50	0.05				1	50	0.05				
Water Cooler	1	1000	1										
PUMP										1	7500	7.5	
	TOTAL LOAD		26.29	TOTAL LOAD		0.89	TOTAL LOAD		0.47	TOTAL LOAD			7.5
MEASURED LOAD (IN HP)			35.2	MEASURED LOAD (IN HP)			1.2	MEASURED LOAD (IN HP)		0.6	MEASURED LOAD (IN HP)		10.05
PROPOSED LOAD			40	DEMANDED LOAD			4	DEMANDED LOAD		0.5	DEMANDED LOAD		10

On Analysis of the Load profile of Auxiliary loads which also includes the New Building for MA degree, the load connected will be 35.2 HP as per the equipment's proposed above. Taking the margin of safety ,40 HP can be taken as the connected load from the MGVCCL. Also the same tariff structure can be taken (GLP) which ensures subsidized energy tariffs from the Discom.

Rest of the places the measured load is almost same as the demanded load except at sports room, where the demand taken is 4 hp , however requirement presently is 1.2 HP and henceforth more electrical loads can be added to the sports room.

Energy savings by replacing tubelights with LED lamps

The College has 56 nos of tube lights installed at various locations as classrooms labs etc. Replacing these 50 watt tubelights with 10 watt led lamps will generate same lux levels .The other advantage is the long life of LED lamps as compared to tubelights .Replacing the same will give an Annual monetary savings of Rs18,816 and a Unit savings of 2688 units per annum.The payback period can be 4 months.

Replace 50 Watt Tubelights with 10 Watt LED Lamps.			
Luminair type	Nos.	Actual Wattage	Total
Tubelights	56	50 watt	2.8 kw
LED	56	10 watt	0.56 kw
Savings in KW			2.24 kw
For 4 hrs, kwh (From 11 am to 3 am)			8.96 kwh
Savings in Kwh/Annum	300 days working		2688 kwh
Savings @7 Rs.per kwh (Per Unit price)			Rs 18,816
Investment @ 100 Rs.	56		Rs 5600
Payback period in Months			4 months

Energy savings by Energy Efficient Fans in Place of Conventional Fans

By replacing the conventional Fans by BLDC technology fans the Annual monetary savings of Rs 84,890 and a Unit savings of 12,127 units per annum.

<u>Replace 90 Watt ceiling Fans with 28 Watts Energy Efficient fans.</u>			
Luminair type	Nos.	Actual Wattage	Total
Ceiling Fans	163	90 watt	14.67
Energy Efficient Ceiling Fans	163	28 Watt	4.5
Savings in KW			10.1 kw
For 4 hrs, kwh			40.4 kwh
Savings in Kwh/Annum	300 days working		12,127 kwh
Annual Savings @7 Rs.per kwh (Per Unit price)			Rs 84,890

The Replacement with Energy Efficient Fans can be done in a phased manner with the most old fans can be replaced initially and then the newer ones. The Energy efficient fans run on BLDC Technology which is brushless DC motor technology.

Energy savings by Installing Solar Panels in place of Conventional Electricity.

The current load taken is 40 hp . However, the average load from load analysis is 20 hp only It is suggested to install Solar as a power source after all energy efficient equipment's recommended are installed. The expected load after installation of Energy efficient equipment's will be about 50 % of the existing load ie about 10-12 HP . Henceforth solar installation should be initiated after load management exercise.

Solar Capacity	KW/HP
Contract Demand Taken (In Bill)	41
Actual Average Demand	20
Solar Capacity presently recommended (in KW)	15
Price Per KW (Commercial -In Rs)	50000
Approx Installation Cost (In Rs)	750000
Payback Period (In Years)	3.1

On Implementation of Energy Efficiency Measures, the solar capacity requirements will reduce to 50 % and so for a 10 KW system , the approx. installation cost will be 5 lakhs.

Further the installer to be chosen must be registered with GEDA and must use non imported panels and Inverter for solar generation.

As the college activities are mostly in day time, hence the solar generation will be beneficial for the college with a 3 Years Payback period.

With Net metering policy, college can get benefit of selling extra generated units, back to MGACL at approx. 2.50 per Unit, which can be beneficial.

**LIST OF MANUFACTURERS OF ENERGY SAVING/EFFICIENCY INSTRUMENTS /
EQUIPMENTS / DEVICES**

1	<p><i>Electronics Energy Meters & Clip on Power Meters</i></p> <p>Secure Meter Limited , P.B. No. 30, Pratap Nagar Indi. Area , UDAIPUR -313 003</p> <p>Alacrity Electronics Ltd., Atandra , 15, Tirumalia Road, T. Nagar , CHENNAI-600 017</p> <p>Trinity Engineering, B/5, Akash Ganga Complex, Near Pranav ExtentionSociety, Manjalpur , Baroda-390 004 Trinity @wilnettonline.net</p> <p>Larson &Tourbo Limited, P.O.Box No. 8119 Mumbai -400 071</p> <p>Industrial Controls & Devices (I) Pvt.Ltd., Mettukppam Road, Via- Alapakkam Road, Madura Voyal, CHENNAI-602 102</p> <p>Meco Instrument Pvt. Ltd., P.O. Box No.6388, Sewree, MUMBAI-400 015</p> <p>Enercon System Pvt. Ltd., 23, KHB Light Industires Area, P.O. Box No. 6418, Yelahanka, BANGALORE -560 064, enercon@glasbg01.vsnl.net.in</p>
2	<p><i>Led Lighting System</i></p> <p>Philips Electronics India Ltd W-234, Rabale MIDC, Navi Mumbai, Mumbai-400 071</p> <p>Osram India Pvt Ltd EL-21 Electronics Zone, MIDC, Bhosari, Pune-411 026</p> <p>Havells India Ltd, 23, KHB Light Industries Area, P.O. Box No. 6418, Yelahanka BANGALORE-560 064 enercon@glasbg01.vsnl.net.in</p>
3	<p><i>Energy Efficient Fans Manufacturere</i></p> <p>Atomberg Technologies. Ltd., 1205,Millenium Business Park MIDC,Navi Mumbai,Maharashtra-400710</p> <p>Super fans Ltd., C/O Versa Drives Pvt Ltd , Coimbatore,</p> <p>Industries Meters Pvt. Ltd. Advent , 12-A, Gen. Jagannath, Bhosle Marg, Mumbai-400 021</p> <p>Secure Meter Limited., P.O. Box 30 Pratapnagar Industrial Area, Udaipur-313 003 Sml.udp@sprintpg.ems.vsnl.net.in</p>
4	<p><i>Air Flow meters</i></p> <p>ACD Machine Controls Co. Pvt. Ltd. E/6, UdyogSadan, 2, MIDC, Andheri (East)</p>

	<p>Mumbai-400 093</p> <p>Air Devices Corporation 12/A, Bombay Shopping Center, Race course Road, Baroda -390 005</p> <p>Electronics International P.B. no. 385, Sampige Road, Near 11th Cross , Malleswaram Bangalore -560 003</p> <p>Keith Electronics 426, Ansal Chamber Place, New Delhi -110 066 keith@del3.vsnl.net.in</p>
5	<p>P.F. Controller/ Indicator</p> <p>Trinity Engineering, B/5, Akash Ganga Complex, Near Pranav ExtentionSociety, Manjalpur, Baroda -390 004 trinity@wilnetonline.net</p> <p>Process technique Electronics Pvt. Ltd., Sandilya, 324 –KonenaAgrahara, P.B. No. 1776, Vimanpura P.O., Bangalore -560 017 ssn@bir.vsnl.net.in</p> <p>Neutronics Manufacturing Co. Ltd., 12-A, MarolMaroshi Road, Opp. Old State Bank, andheri (E) Mumbai-400 059</p> <p>Yesha Electronics Pvt. Ltd., C-2/18 , Industrial Estate, Gorwa Road, Baroda -390 016 Yesha.brd@sme.sprintrpg.emg.vsnl.net.in</p> <p>Larsen & Turbo Ltd., P.O. Box No: 8119, Mumbai -400 051</p>
6	<p>P.F. controllers with Thyristor Switches</p> <p>R.M.S. Automation Systems Pvt. Ltd., W-218, MIDC, Ambad, Nasik -422 010</p> <p>Bharat Heavy Electronics Ltd., Electronics Division, P.B. No. 2606, Mysore Road, Bangalore -560 026</p>
7	<p>Static P.F. Controller</p> <p>ABB Ltd., Reactive Power Compensation Division, Plot no. 5&6 ,II Phase, Penya Industrial Area, Bangalore -560 058</p>
8	<p>Current density meter</p> <p>Fisher Instrumentation (GB) Ltd., Gordletn Industrial Park, Hannah Way, Lymington / Hampshire England</p> <p>Globatek 684-5, 47 th Cross, 8th Block, Jayangar, Bangalore -560 082</p>
10	<p>Temperature Control & Monitoring</p> <p>S.J. Enterprise, Opp. Industrial Estate, Makarpura, Ajamer -305 002</p> <p>Atlop Industries No. 392, G.I.D.C., Makarpura, Vadodara -390 010</p> <p>Artech Labs, A-3, UdyogSadon, No.3, Opp. SEEPZ, Central Road, M.I.D.C., Mumbai -400 093</p> <p>Toshnival Industries Pvt. Ltd., Industrial Estate, Makhupura, Ajmer -305 002</p>

	<p>Masibus Process Instruments, B/30, G.I.D.C., Electronics Zone, Gandhinagar -382 044</p> <p>Instrument Reaserch Associates Ltd., Instrumentation House, P.B. No. 2304, No. 19, Mysore Deviation Industrial Estate, Bangalore – 560 023</p> <p>Radix Sensors Pvt. Ltd. Unit 1,B/4, 1st Floor, Ghanshyam Industrial Estate, Andheri (East), Mumbai -400 053</p> <p>G.P. Electronics, 987/5, G.I.D.C. Industrial Estate, Makarpura, Vadodara-390 010</p>
10.	Pressure Guages
	<p>Manometer (India) Pvt. Ltd., Manu Mansion, 16, ShahidBhagat Singh Road Mumbai – 400 023</p> <p>Fitzer Sales Pvt. Ltd., 248, Ambedkar Estate, Atali, P.O. Mohone, Thane -421 102</p> <p>Instrument Research Associates Pvt. Ltd., Instrumentation House, P.B.No. 2304, No. 19, Mysore Deviation Rd., Bangalore – 560 023</p> <p>J.N. Marshall Systems & Services P.B. No. 1 Bombay –Pune Road, Kasarwadi, Pune -411 018</p>
11	High Efficiency Motors
	<p>Crompton Greaves Ltd. Machine Division-1, Dr. E. Moses Road, Worli, Mumbai -400 018</p> <p>N.G.E.F. Ltd., P.B. No. 3876, Byappanahalli, Bangalore – 560 038</p> <p>Bharat Bijlee Limited P.B. No. 100, Thane –Belapore Road, Thane -400 601</p> <p>Kirloskar Electronic Ltd., Unit no. 1, P.B. No. 5555, Malleswaram (West), Bangalore -560 055</p> <p>Siemens Ltd. Electric Mansion, 1086, Appasaheb P.B. No. 19111. Mumbai -400 071</p> <p>Asea Brown Boveri Ltd., Plot no. 32, Industrial Estate, Faridabad -121 001</p> <p>Polyphase Motors 720, GIDC, Makarpura, Baroda -390 010</p>
12	Star –Delta Auto Controllers For Motors