



* G.S.B.T. *

GOJAN SCHOOL OF BUSINESS AND TECHNOLOGY

Approved by A.I.C.T.E. New Delhi & Affiliated to Anna University, Chennai

NAAC Accredited Institution | An ISO 9001:2015 Certified Institution

Recognized by UGC u/s 2(f) & 12(B) of the UGC Act

80 Feet Road, Edapalayam, Redhills, Chennai - 600 052.

**7.1.6 Quality audits on environment and energy regularly undertaken by the Institution
and any awards received for such green campus initiatives:**

Energy audit report

ENERGY AUDIT REPORT

**GOJAN SCHOOL OF BUISNESS AND
TECHNOLOGY
CHENNAI**

CONDUCTED BY
EVREN ENERGYS (P) LTD
NEW#31, OLD#16, KENNEDY SQUARE MAIN ROAD, TVK NAGAR
CHENNAI-11

Seller Restrictions

This data shall not be disclosed and shall not be duplicated, used, or disclosed in whole or in part for any purpose. If a contract is awarded to EVREN ENERGYS (P) LIMITED as a result of or in connection with the submission of this data, the client or prospective client shall have the right to duplicate, use, or disclose this data to the extent provided in the contract. This restriction does not limit the client's or prospective client's right to use the information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained in all marked sheets.

TABLE OF CONTENTS

1	Overview	3
2	Scope	3
2.1	Scope of Work.....	3
2.1.1	Campus Details	3
2.2	Power Requirements	5
2.2.1	Energy Audit – Observation Summary	6
2.3	College - Energy Consumption Details for the Year 2012.....	8
3	Recommended Rooftop Solar PV Power Plant.....	10
4	Appendix	11

1 Overview

Gojan School of Business and Technology, a Professional Educational Institution located at 80ft Road, Edapalayam, Redhills – Thiruvallur Road, Chennai 600052, desires to install a **Solar Photo Voltaic Captive Power Plant** as part of their Initiative on Embracing Green Energy for catering to the Electrical Power needs of the Institution Campus. In this Green Initiative by Chairman, Evren Energys (P) Limited is proud to be associated, and will leverage its expertise in Design and Development of Solar Energy solutions for Implementing a cost effective and Reliable solution.

2 Scope

2.1 Scope of Work

With the above Green Initiative, the Institution has decided to conduct a detailed Energy Audit to arrive at the Electrical Capacity and Electrical Demand load requirements of the whole Campus covering the entire Electrical Loads. Based on the audit outcome on the Load Demand and Daily Average Energy Consumption, a suitable Rooftop Solar PV Power Plant needs to be proposed and designed, which will cater to the daily daytime Energy Demand of the campus and also a Solar PV Plant with battery storage for Emergency and Night time utility Loads.

2.1.1 Campus Details

Broadly 8 Main Blocks In the campus were covered in the Energy Audit.

1. **Admin Block** accommodating
 - o Administrative office,
 - o Secretary Room,
 - o and Auditorium.
2. **Ground Floor Block** accommodating
 - o Library,
 - o S&H Room,
 - o Drawing Room I,
 - o Drawing Room II,

- Principal Room,
- Physics Laboratory,
- Chemistry Laboratory ,
- 7 Class Rooms,
- Exam Cell.

3. First Floor-Block accommodating

- Computer Laboratory,
- ECE Staff room,
- ECE laboratory,
- Communication Laboratory ,
- 7 Class Room,
- DSP Laboratory.

4. Second Floor-Block accommodating

- VLSI Laboratory,
- Centre for R&D,
- Power System Laboratory,
- Control System Laboratory,
- 4 Class Room (EEE...),
- English Communication Laboratory,
- Power Electronic Laboratory,
- CAD/CAM,
- 6 Class Room (Mech, Aero, etc.....),
- 7Class Rooms.

5. Adjacent Building to Main Block accommodating

- Seminar hall,
- M.Ed Library,
- Avionics Laboratory,
- Civil Class
- Metrology Laboratory,
- Civil Laboratory,

- M.Ed Class,
- Power Electronics & Drive Laboratory,
- Engineering Practice,
- MBA Staff Room,
- 3 MBA Class Room,
- Aeronautical & Mech Laboratory

6. **Canteen:**

7. **Hostel** accommodating both Boys & Girls Hostel.

8. **Pathway & Placement** accommodating

- Placement cell,
- Power Room,
- And Pathway.

2.2 Power Requirements

- 230V AC supply to Tube Lights, Fans, Computer, Air Conditioner and other Laboratory equipment : Through Solar Grid-Tie system
- 230V AC supply to Tube Lights, Fans, Computer in hostel: Through Solar Hybrid Power plant system with minimal Battery Back-Up
- Duty cycle: 8 hours daily and Approximately 300 days a year.

Site Observation Details

- Location : Chennai, INDIA
- Location Type: College Campus with multiple Block surrounded by gardens with lots of free Space
- Shadow Free Rooftop Space : Available
- Types of Existing Electrical Loads in College Campus & Hostel - (typical Wattage of Load)
 - Tube light(40W)
 - Ceiling Fan(65W)
 - Personal Computer(150W)

- Air Conditioner(1500W)
- Printer(100W)
- Scanner(150W)
- Projector(150W)
- CFL with Various Wattages
- Motors with Various HP
- Types of Existing Electrical Loads in Canteen
 - Grinder -1HP
 - Mixer(800W)
 - Tube Light(40W)
 - Fan (65W)
 - TV (150W)
- Existing TNEB Power supply
 - Low Tension,3 phase
 - Connected Demand : 110KW
- Existing Emergency Power Back-Up System:
 - Diesel Generator-125KVA
 - UPS up to 120KVA

2.2.1 Energy Audit – Observation Summary

A Detailed Energy Audit was conducted on 19th and 20th of Feb 2013 covering the connected electrical load and also the covering the usage pattern. The details of Individual loads and usage demand, loading factor etc., can be found in the appendix.

Observation Summary

Peak Demand

S.no	Description	Observation
1	Estimated Peak Demand Load in KW	291,466 watts (Approximately 291.5KW)
2	Estimated Peak energy consumption(Kwh/day)	1033 units/day

Load-wise Usage Demand

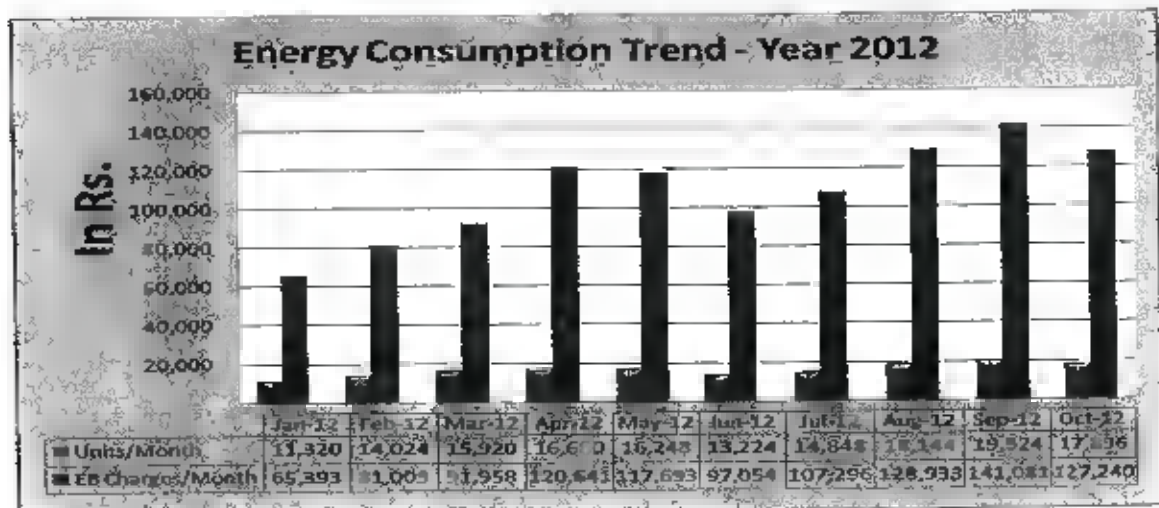
S.no	Description	Duty	Observation
1	Estimated Real Usage (Demand Load)-Total Loads-	*Day time	154,283 Watts (Approximately154KW)
2	Estimated Real Usage(Demand Load) - Total Loads	**Night Time	21,156 Watts (Approximately21KW)
3	Estimated Energy Consumption (Kwh)	*Day time	488 Kwh (Units)
4	Estimated Energy Consumption (Kwh)	**Night Time	193 Kwh (Units)
5	Total Estimated Energy Consumption (Kwh)	per day	681Kwh (Units)

*Day time: 8am to 6pm

**Night time : 6pm to 8am

2.3 College - Energy Consumption Details for the Year 2012.

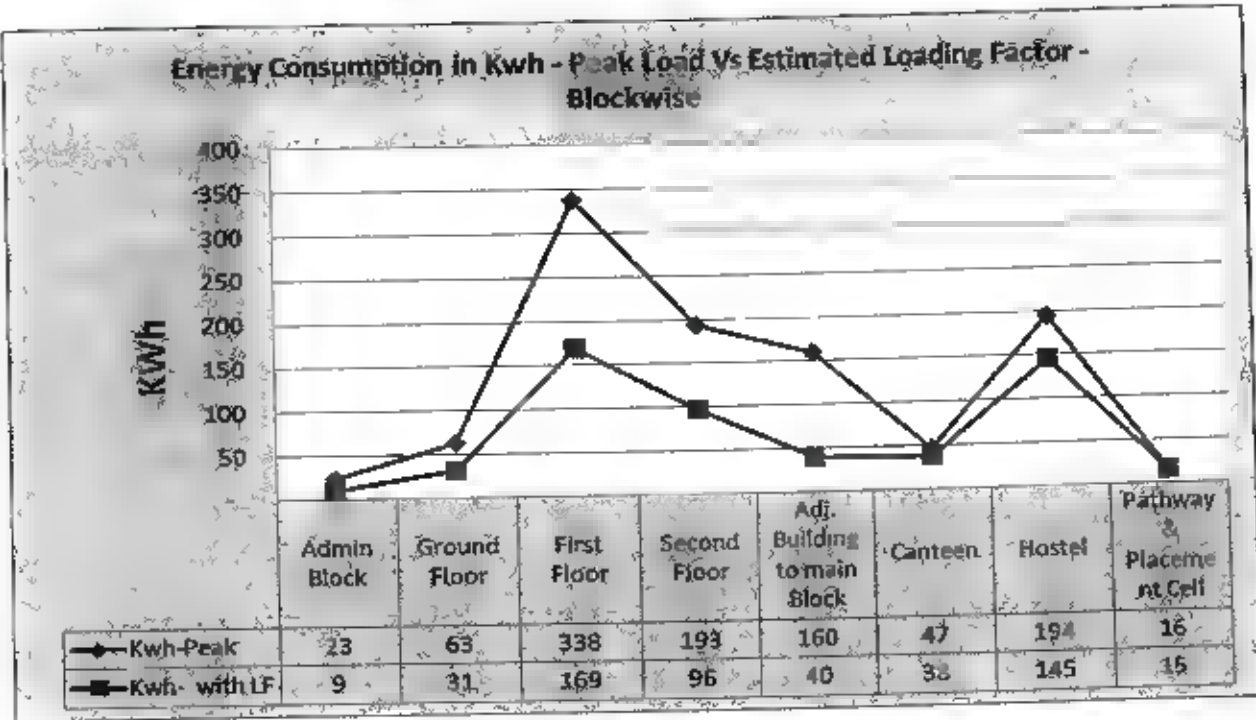
Energy Consumption Chart -Year 2012				
#	Year 2012	Actual Monthly Consumption -Kwh (Units)	Average Daily Consumption -Kwh/Day (2 Days working /month)	Total amount Of the bill in Rs.
1	Jan-12	11,320	472	65,393
2	Feb-12	14,024	584	81,009
3	Mar-12	15,920	663	91,958
4	Apr-12	16,680	695	120,641
5	May-12	16,248	677	117,693
6	Jun-12	13,224	551	97,054
7	Jul-12	14,848	619	107,296
8	Aug-12	18,144	756	128,933
9	Sep-12	19,924	830	141,081
10	Oct-12	17,896	746	127,240
Average/Month		15,823	659	107,830



Conclusion : By comparing the TNEB energy consumption pattern of the College from Jan'12 to Oct'12, with our Energy auditing observation for Load-wise Usage Demand, it is understood that average consumption ranges between 600~700 (kwh)units/day.

Energy Demand and Consumption - Block wise Summary

#	Blocks	Estimated Peak Kwh/Day		Estimated Peak Total KWh/d	Assumed Loading Factor Day	Assumed Loading Factor Night	Total Load with LF(Day) - Watts	Total Load with LF(Night) watts	Energy Consumption in KWH (with LF) Day	Energy Consumption in KWH (with LF) Night	Energy Consumption in KWH (with LF) Day
		Day	Night								
1	Admin Block	18.37	4.68	23	0.5	0.0	6,280.50	-	9.185	0	9
2	Ground Floor	62.11	0.655	63	0.5	0.0	8,927.50	-	31.055	0	31
3	First Floor	337.78	0	338	0.5	0.0	22,455.00	-	168.89	0	169
4	Second Floor	192.71	0	193	0.5	0.0	13,047.50	-	96.355	0	96
5	Adj. Building to main Block	158.955	0	160	0.25	0.0	39,158.75	-	39.98875	0	40
6	Canteen	42.05	4.84	47	0.8	0.8	9,852.00	9,852	33.64	3.872	38
7	Hostel	17.1	177.3	194	0.2	0.8	3,720.00	14,880	3.42	141.84	145
8	Pathway & Placement Cell	0.78	14.73	16	0	1.0	-	2,495	0	14.73	15
		831	202	1,033			103,441	27,227	383	160	4543



3 Recommended Rooftop Solar PV Power Plant

With reference to the Energy Audit Report Observations on Peak Demand Load, Estimated actual Usage Load Capacity requirement (Block-wise and Load-wise) with loading factors into consideration, monthly Energy Consumption pattern of the campus, and Power Blackout schedules, a 100KWp Solar PV Rooftop Power Plant is recommended comprising the following Types and respective Capacity.

#	Description	Utility
1	10KWp Rooftop Grid Tie Solar Power Plant with Micro Inverters	<ul style="list-style-type: none"> ✓ Will Cater Energy Demand of Daytime Loads ✓ Can generate around 200 ~ 275 Kwh (Units)/Day ✓ Capable of Exporting back to Grid in case of Capacity under utilization
2	40KWp Rooftop Grid Tie Solar Power Plant with String Inverters.	<ul style="list-style-type: none"> ✓ Will Cater Energy Demand of Daytime and Night time Loads ✓ Can generate around 200 ~ 275 Kwh (Units)/Day ✓ Capable of Exporting back to Grid in case of Capacity under utilization
3	50KWp Rooftop Hybrid Type Solar Power Plant with 2 ~ 3 hrs Battery Backup (Centralized Inverter)	<ul style="list-style-type: none"> ✓ Will Cater Energy Demand of Daytime and Night time Loads ✓ Can generate around 200 ~ 275 Kwh (Units)/Day ✓ Capable of Exporting back to Grid in case of Capacity under utilization

GOVERNMENT SCHOOL OF BUSINESS AND TECHNOLOGY

FULL CAMPUS - ELECTRICAL LOADS DETAILS - Estimated Peak Load & Kwh and Estimated Average Usage Load & Kwh

No	Room	Load Equipment	Approx W attage	Total Available Quantity	Est. Usage Qty		Est. Usage Load & Kwh		Est. Usage Load & Kwh		Total KWh /Year	Est. Usage - Term Watts	
					Day (8 am to 5 pm)	Night (6 pm to 8 am)	Day (8 am to 5 pm)	Night (6 pm to 8 am)	Day (8 am to 5 pm)	Night (6 pm to 8 am)			
	Admin Block												
1	Administration Office	Fan	65	2	0	10	0	1.95	0	5.2	0	5.2	195
		Tubelight	45	4	2	2	0	0.18	0.09	0.36	0.18	180.0	0.5
		LCD TV	150	1	0	1	0	0.15	0	0.15	0	150.0	0.2
		Computer	200	2	0	10	0	3	0	3	0	300.0	3.0
		Printer	200	1	0	1	0	0.1	0	0.1	0	100.0	0.1
		AC	1500	1	0	2	0	0	0	0	0	1,500.0	3.0
		AC	1500	3	0	0	0	0	0	0	0	4,500.0	0
		Fan	65	2	1	10	0	0.65	0	1.3	0	130.0	1.3
		CFL	18	4	2	4	0	0.38	0	0.76	0	76.0	0.8
		AC	1500	1	1	3	0	4.5	4.5	4.5	4.5	1,500.0	9.0
		Fan	65	43	0	0	0	0	0	0	0	2,795.0	0
		Tubelight	45	18	0	0	0	0	0	0	0	810.0	0
	Ground Floor												
4	Library	Fan	65	22	20	0	1	0	0.65	1.43	0	1,430.0	1.4
		Tubelight	45	18	2	0	1	0	0.09	0.81	0	810.0	0.8
		Computer	150	3	2	0	0	2.4	0	3.6	0	450.0	3.6
		CCTV	50	2	2	0	0	0.8	0	0.8	0	100.0	0.8
		Fan	65	6	4	0	0	2.08	0	3.12	0	390.0	3.1
		Tubelight	45	4	0	0	0	0	0	1.44	0	180.0	1.4
		Fan	65	7	0	0	0	0	0	0	0	455.0	0
		Tubelight	45	13	0	0	0	0	0	0	0	585.0	0
		Fan	65	13	0	0	0	0	0	0	0	845.0	0
		Tubelight	45	17	0	0	0	0	0	0	0	765.0	0
		AC	1500	1	0	0	0	0	0	0	0	1,500.0	1.5
		Printer	150	1	1	0	0	1.44	0.18	1.44	0.18	180.0	0.18
		Computer	150	4	4	0	0	2.6	0.325	2.6	0.325	325.0	2.6
		Fan	65	5	5	0	0	7.5	0	7.5	0	1,500.0	7.5
		AC	1500	1	1	0	0	0.2	0	0.2	0	100.0	0.2
		Printer	150	1	1	0	0	1.2	0.15	1.2	0.15	150.0	1.2
		Computer	150	2	2	0	0	3.12	0	3.12	0	520.0	3.1
		Fan	65	8	8	0	0	0	0	0	0	520.0	0
		Tubelight	45	3	0	0	0	0	0	0.27	0	135.0	0.3
		Computer	150	1	1	0	0	0.05	0	0.05	0	100.0	0.1
		Printer	100	1	1	0	0	2.34	0	2.34	0	360.0	2.3
		Fan	65	6	6	0	0	0	0	0	0	400.0	0.4
		Tubelight	45	8	0	0	0	0	0	0.9	0	360.0	0.9
		Computer	150	2	2	0	0	0	0	0	0	300.0	0
		Printer	150	1	1	0	0	10.92	0	10.92	0	1,638.0	10.9
		Fan	65	49	20	0	0	0	0	0	0	1,575.0	0
		Tubelight	45	35	0	0	0	1.95	0	4.95	0	455.0	4.6
		Fan	65	7	3	0	0	0.27	0	0.27	0	270.0	0.3
		Printer-Canon	1500	1	1	0	0	1.5	0	1.5	0	1,500.0	1.5
		Computer	150	3	0	0	0	4.5	0	4.5	0	450.0	4.5
		Printer	100	1	1	0	0	0.1	0	0.1	0	100.0	0.1

GDANS SCHOOL OF BUSINESS AND TECHNOLOGY

FULL CAMPUS ELECTRICAL LOADS DETAILS, Estimated Peak Load & kWh and Estimated Average Usage Load & kWh

No	Rooms	Load Equipment	Approx W watts	Total Available Capacity	Est. Usage (kWh/Day)		Est. Usage (kWh/Day)		Est. Usage (kWh/Day)		Est. Usage (kWh/Day)		Total watts Peak	Total kWh Peak	Est. Usage Peak (kWh/Day)	Est. Usage Peak (kWh/Day)	
					Day (8 am to 6 pm)	Night (6 pm to 8 am)	Day (8 am to 6 pm)	Night (6 pm to 8 am)	Day (8 am to 6 pm)	Night (6 pm to 8 am)	Day (8 am to 6 pm)	Night (6 pm to 8 am)					
13	Computer Lab	Tubelight Fan Computer	45 65 150	20 50 200	0 25 100	0 0 0	1 8 8	0 0 0	0 13 120	0 0 0	0 0 0	0 0 0	0 26 240	0 0 0	0 0 0	0 0 0	
14	ECE Staff room	Printer Scanner Fan Tubelight	200 200 45 45	1 200 8 2	1 0 0 0	1 0 0 0	0 0 0 0	0 0 0 0	0 0 3.42 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
15	ECE Lab	Computer Printer Fan Tubelight	150 100 45 45	2 1 1 10	2 1 1 10	2 1 1 10	0 0 0 0	0 0 0 0	0 0 2.4 5.2	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
16	Communication Lab	Fan Tubelight	65 45	4 36	4 15	0 0	0 0	0 0	2.08 3.36	0 0	0 0	0 0	2.08 18.72	0 0	260 2340	2.1 18.7	260 1170
18	DSP Lab	Computer Fan Tubelight	150 45 45	30 6 2	15 6 0	0 0 0	0 0 0	0 0 0	18 3.12 0	0 0 0	0 0 0	0 0 0	36 3.12 0	0 0 0	4500 390	36 3.1	2250 390
19	VLSI	Computer Fan Tubelight	150 65 45	14 6 2	14 6 0	0 0 0	0 0 0	0 0 0	16.8 3.12 0	0 0 0	0 0 0	0 0 0	16.8 3.12 0	0 0 0	2100 390	16.8 3.1	2100 390
20	Centre for RAO	Fan Tubelight Computer	65 45 150	2 2 6	2 2 6	0 0 0	0 0 0	0 0 0	0.13 0.9 1.8	0 0 0	0 0 0	0 0 0	0.13 0.9 3.6	0 0 0	130 900	0.1 0.9	130 900
21	Power System Lab	Computer Fan Tubelight	150 65 45	30 6 0	15 6 0	0 0 0	0 0 0	0 0 0	1.8 4.16 2.34	0 0 0	0 0 0	0 0 0	3.6 4.16 2.34	0 0 0	4500 390	3.6 4.2	2250 390
22	Control System Lab	Fan Tubelight	65 45	6 0	6 0	0 0	0 0	0 0	2.34 0	0 0	0 0	0 0	2.34 0	0 0	390 0	2.3 0	390 0
23	EEETL ... 4 Class Room	Fan Tubelight Computer	65 45 150	24 8 32	12 0 16	0 0 0	0 0 0	0 0 0	6.24 19.2 3.64	0 0 0	0 0 0	0 0 0	12.48 38.4 3.64	0 0 0	1560 4800	12.5 38.4	780 2400
24	English Communication Lab	Fan Tubelight Computer	65 45 150	7 1 1	7 0 1	0 0 0	0 0 0	0 0 0	3.64 1.2 0.05	0 0 0	0 0 0	0 0 0	3.64 1.2 0.1	0 0 0	455 150	3.6 1.2	455 150
25	Power Electronics Lab	Tubelight Computer Printer	45 150 150	1 3 2	0 1 1	0 0 0	0 0 0	0 0 0	0 1.2 0.05	0 0 0	0 0 0	0 0 0	0 1.2 0.1	0 0 0	135 200	1.2 0.1	135 200
26	CAD/CAM	Computer Printer Fan Tubelight	150 100 65 45	30 1 7 0	15 1 7 0	0 0 0 0	0 0 0 0	0 0 0 0	1.8 3.64 0 0	0 0 0 0	0 0 0 0	0 0 0 0	3.6 3.64 0 0	0 0 0 0	4500 455	3.6 3.6	2250 455
27	Mechanical - 6 Class Room	Tubelight Tubelight Fan	45 45 65	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 7.8	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
28	7 class rooms	Fan	65	35	17	0	0	0	8.94	0	0	0	8.94	0	18.2	18.2	1105