

Jalpaiguri Govt. Engineering College
Jalpaiguri, West Bengal 735102, India



West Bengal State Designated Agency (WBSDA)
Office of the Chief Engineer, Planning Investigation and Design Dept.
4th Floor, Data Centre Complex,
Action Area-1, St. NO.- 41, Rajarhat, Newtown,
Kolkata - 700163
E-MAIL: wbsdac@wbsedcl.in

Acknowledgement:

‘WBSDA’ is thankful to the authority of Jalpaiguri Govt. Engineering College (JGEC), located at Jalpaiguri, for this opportunity.

‘WBSDA’ also acknowledges with gratitude the valuable inputs, cooperation and active participation received of the following officials of ‘JGEC’ towards successful completion of the Energy Audit:

- Prof. (Dr.) Amitava Ray (Principal, JGEC)
- Prof. Gautam Kr. Panda (Dept. of Mechanical)
- Prof. Ashim Mahapatra (Dept. of Mechanical)
- Nominated Students
- And all other staffs of JGEC.

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1.0. Introduction of WBSDA:

West Bengal State Electricity Distribution Company Limited (WBSEDCL) is acting as West Bengal State Designated Agency (WBSDA) with effect from 01/04/2007 in provision to Section 15(d) of the Energy Conservation Act, 2001 and by West Bengal Government Notification No. 116-PO/O/1/1E-04/02 dated 05/07/2007 to coordinate, regulate and enforce provisions of the EC Act, 2001 in the State of West Bengal.

2.0. Audit Team:

‘WBSDA’ has an in-house energy audit team. The audit was carried out by the following members of the ‘WBSDA’ team, as shown below:

- Mr. Prabin Kumar Saha, Addl. Chief Engineer, PIDD, WBSEDCL
- Mr. Niladri Bhusan Das, Superintending Engineer (C), PIDD, WBSEDCL
- Mr. Arindam Basak - Certified Energy Auditor (BEE Regn. No. CEA 30479), B.Tech (E)
- Mr. Chandrakanta Mohapatra, Consultant, M.Tech (Energy)



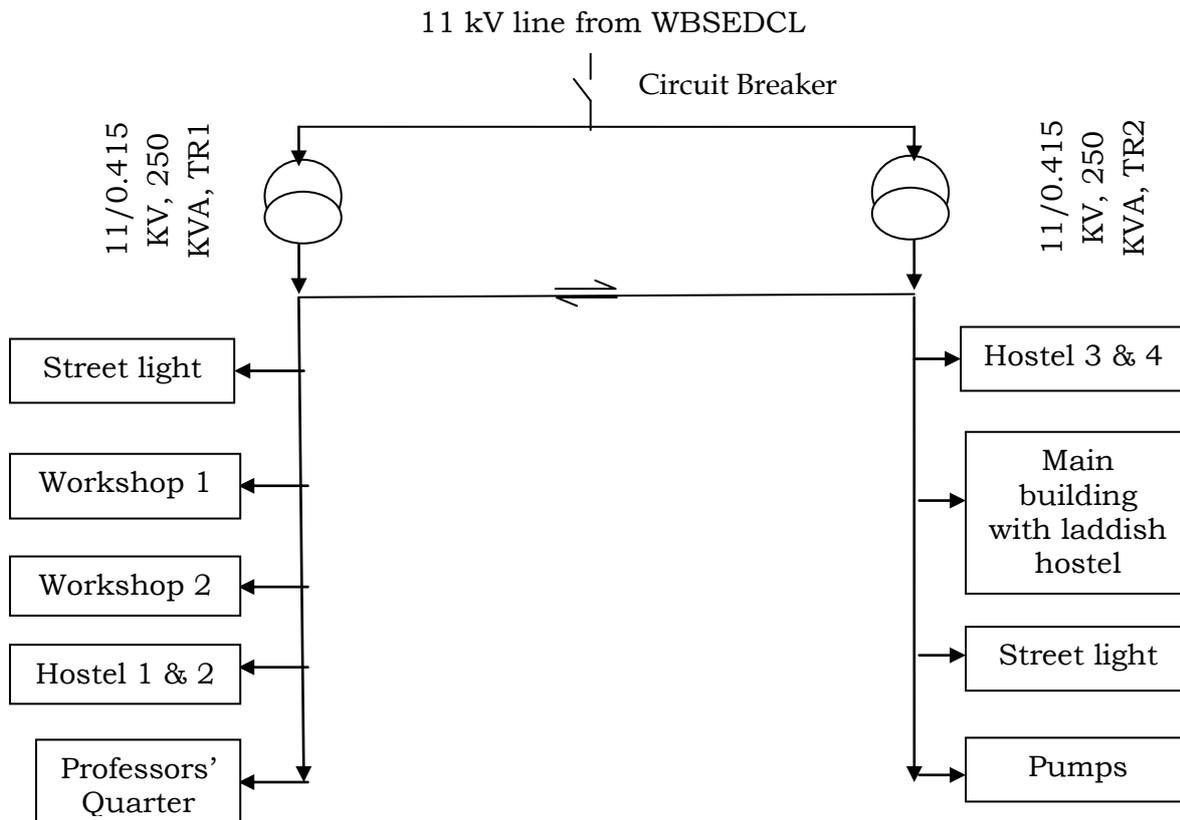
3.0. Profile of JGEC:

Incoming supply of JGEC is 11 kV line from WBSEDCL. There are two (02) no. of 11/0.415 kV Power Transformer of 250 kVA. The LT side of this transformers are connected to busbar from which different loads in the premises are connected.

Energy and Raw Material:

Energy used in the premises is Electricity.

Electrical Single line diagram



4.0. Executive Summary:

- a) This section presents a brief summary of the results of the detailed Energy Audit carried out. The study covers mainly the energy saving opportunities at Electrical System in different areas like reduction of contract demand (kVA), replacement of conventional lights and fans with energy efficient LED lights and BLDC fans etc.
- b) A team of four specialist consultants including Certified Energy Auditor, BEE, MoP, GoI were involved in this energy audit. The detailed energy audit was mainly targeted at identifying practical, sustainable and economically solutions, resulting from a detailed study and analysis of technical parameters. The detailed energy audit involved using a wide range of sophisticated, portable, diagnostic and measuring instruments to generate the data and facilitate in analysis to give a more reliable basis for evaluation of their actual performance.
- c) Electricity is the main source of energy in JGEC. Average monthly electricity consumption the JGEC is 56,994 kWh (Sept 2024- Aug 2025). Electricity cost for this period is Rs. 6.66, 6.68 & 6.70/kWh (as mentioned in the electricity bills) and all the energy saving calculations are based on this.
- d) In average monthly power factor of the plant is found to be 0.961 and JGEC got Rs. 1.17 lakh rebate on the power factor as per schedule of Tariff of WBSEDCL.
- e) Total average Current Harmonic Distortion (%THDi) is 5.77% in the main feeders against transformer 1 and which is under permissible limit of 10%.
- f) Total average Current Harmonic Distortion (%THDi) is 3.2% in the main feeders against transformer 2 and which is under permissible limit of 10%.
- g) Voltage Harmonics Distortions (%THDv) in both the transformers are 1.3% and which is under permissible limit of 5%.
- h) At present maximum demand is 189.00 kVA but presently billing demand is 298.00 kVA (85% of 350 kVA). So if contract demand is reduced to 200 kVA expected annual monetary saving of Rs. 5.85 lakh can be achieved (Annexure B1).
- i) During audit it was found that old conventional tube lights (36W/40W) are installed in the maximum area. This should be replaced by LED lights (20W). Expected annual monetary saving of Rs. 4.88 Lakh can be achieved (Annexure B2).
- j) During audit it was found that old conventional fans (70W/90W) are installed in the maximum area. This should be replaced by energy efficient BLDC fans (28W). Expected annual monetary saving of Rs. 3.75 Lakh can be achieved (Annexure B3).
- k) During audit it was found that old model split type ACs are installed in the premises and this should be replaced by modern EE inverter type BEE star rated ACs. Expected annual monetary saving of Rs. 2.54 Lakh can be achieved (Annexure B4).
- l) During visit it came to notice that most the class rooms and labs in the ground floor are full of debris, spider waves etc. which can be cleaned to get more reflection of lights from wall. It is also recommend keeping windows open where ever possible to use more use of day light.

Details of Energy Saving Measures Recommended in The Energy Audit Report:

Sl. No.	Proposed Energy Conservation and Retrofit Measures	Proposed Annual Energy Savings (kWh)	Proposed Annual Monetary Savings (Rs. In lakh)	Total Investment including Installation (Rs. In lakh)	Simple Payback Period (Years)	ROI (%)	Ton of CO ₂ emission reduction per annum (0.82 kg/kWh)
1	<i>Reduction of contract demand from 350 kVA to 200 kVA</i>	-	5.83	0.00	Immediate	-	-
2	<i>Replacement of old conventional fans (75W & 90W) with BEE star rated energy efficient BLDC fans(28W)</i>	56,090.10	3.75	14.88	4.79	21.79	45.99
3	<i>Replacement of old conventional tube lights (40W & 36W) with energy efficient BEE star rated LED lights(20W)</i>	73,094.40	4.88	2.16	0.45	223.59	59.94
4	<i>Replacement of old Air Conditioners with energy efficient BEE star rated ACs</i>	37,994.88	2.54	12.21	4.69	21.39	31.16
Total		1,67,179.38	17.00	29.24	-	-	137.09

* Please refer **Annexure B1 to B4** for detailed calculation.

5.0. Methodology:

The Energy Audit carried out generally followed the guidelines provided in the Energy Conservation Act 2001.

Initially, a list of the major equipment was obtained from JGEC. The tests and studies carried out covered all running Transformers, fresh water pumps. A walk through energy audit was conducted note down the existing appliance details in the class rooms, labs, quarters and hotels. Lux level survey was also conducted.

After studying the field observations and measurements, an analysis has been carried out to identify the major areas for energy conservation. Energy savings recommendations along with proposed energy savings and payback periods is mentioned. Refer the **Summary of Energy Conservation Measures**.

Electricity unit charge – Rs. 6.66, 6.68 & 6.70 per kWh (as per electricity bills).

In the years to come, the cost of the energy inputs will almost invariably increase and the payback period will thus be lower than those projected in this report.

Field Study & Observations:

An field study was carried out in JGEC, the results of which have been presented in various Annexure of this report. The Annexure are complete with observations, analysis and recommendations from which conclusions have been drawn on probable energy conservation retrofit measures.

Refer to **Annexure A1 to Annexure A6** for detailed analysis of various Field Studies.

Also, Refer to **Annexure – B1 to Annexure – B4** for detailed analysis of Energy Saving Measures.

Annexure – A1

Electricity Tariff & Bill Analysis (Sept. 2024 – Aug. 2025):

Basic Tariff Structure Applicable for JGEC:

Supply Voltage : 11 kV
Consumer Category : Educational Institute
Contractual Demand : 350 KVA

Presently Basic Tariff is broadly classified as Two Part:

1. Energy Charge in kWh, which varies with the energy consumption.
2. Demand Charge in kVA, which depends on contract demand & maximum demand recorded at energy meter. Beside these-
 - Over drawl demand charges above contract demand will be charged in monthly electricity bill.
 - Power Factor Penalty/Rebate:- applicable as per maintenance of monthly power factor.
 - Meter Rent:- Fixed for each month

DETAILED ENERGY AUDIT
Jalpaiguri Govt. Engg. College

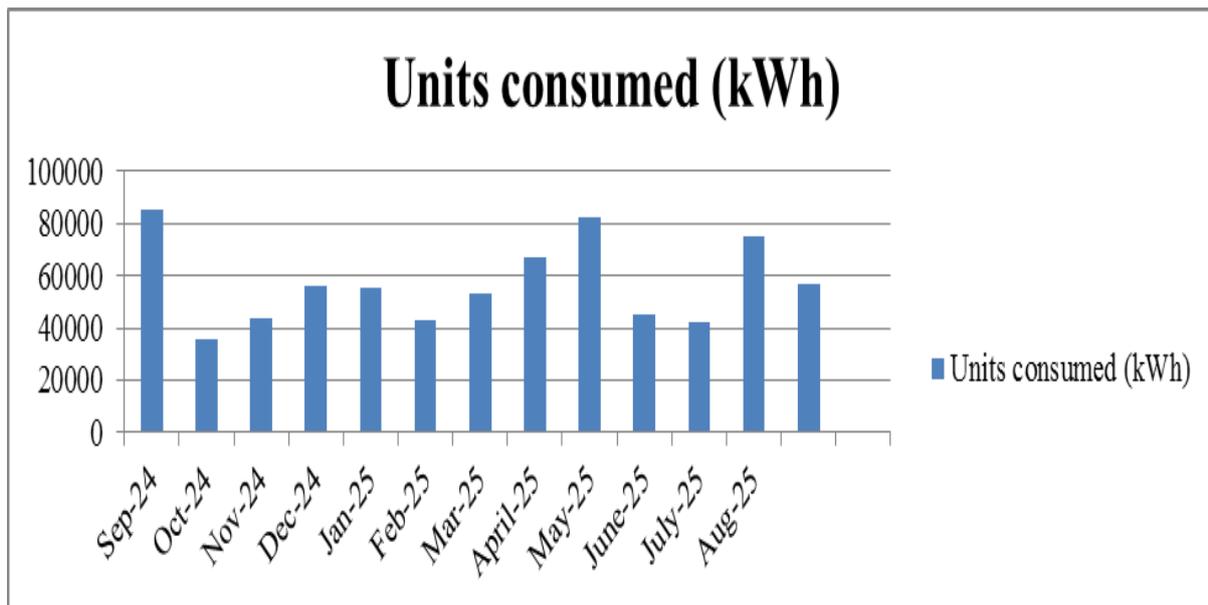


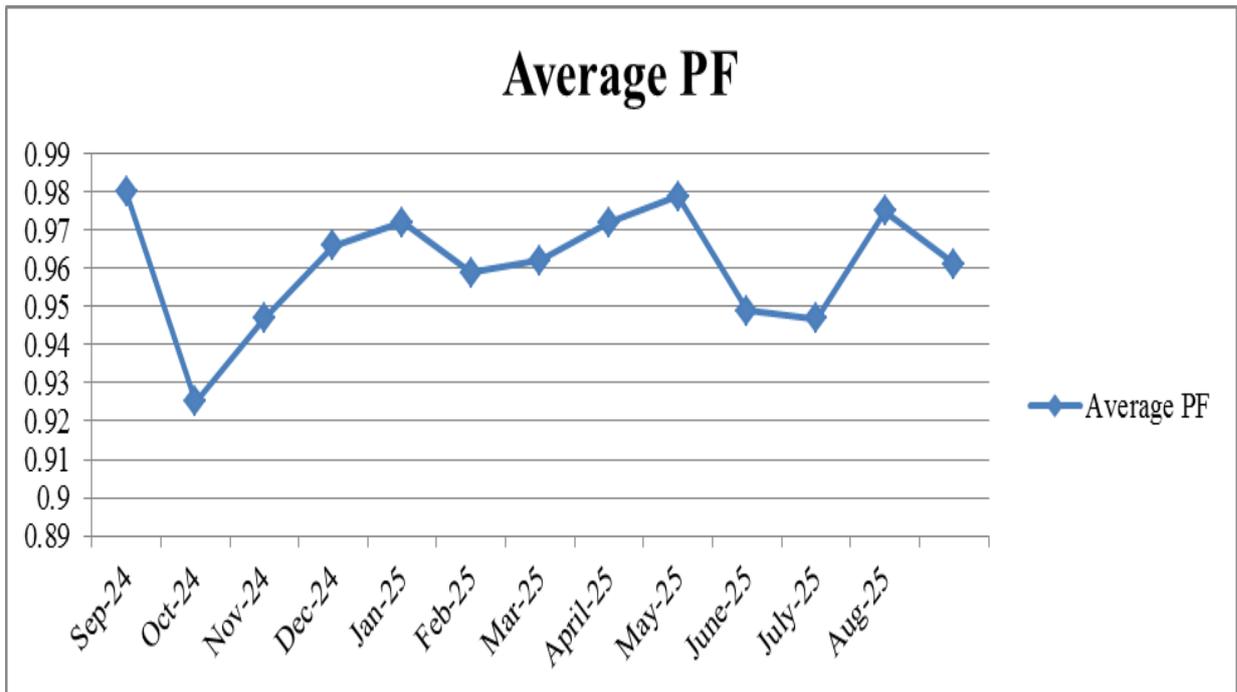
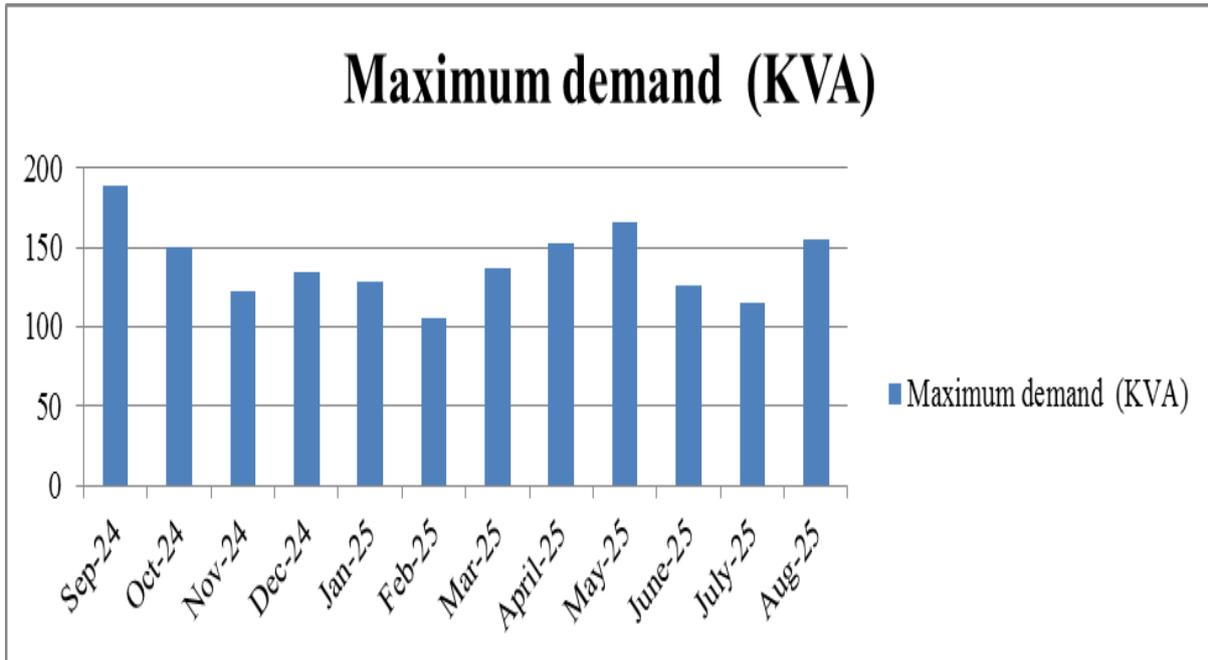
Electricity bill analysis of JGEC (Sept. 2024- Aug 2025):

Month & Year	Contractual demand (kW)	Average load factor (%)	Maximum demand (KVA)	Billing demand (KVA)	Demand charges (Rs.)@Rs 384/KVA	Units consumed (kWh)	Cost of electricity (Rs./kWh)	Energy charges (Rs.)	Avg. PF	PF rebate (Rs.)	Meter Rent (Rs.)	Total bill (Rs.) {kWh+KVA+ Meter Rent- Rebate}	Late payment surge charge (Rs.)	Total (in Rs.)
Sep-24	350	40.67	189	298	114432.00	85435	6.68	570705.80	0.98	22828.00	2400.00	664709.80	0.00	664709.80
Oct-24	350	17.25	150	298	114432.00	35325	6.68	235971.00	0.925	1179.75	2400.00	351623.25	0.00	351623.25
Nov-24	350	21.68	122	298	114432.00	44010	6.66	293106.60	0.947	4396.60	2400.00	405542.00	0.00	405542.00
Dec-24	350	26.13	134	298	114432.00	55920	6.66	372427.20	0.966	9310.68	2400.00	479948.52	0.00	479948.52
Jan-25	350	25.65	128	298	114432.00	55205	6.66	367665.30	0.972	11029.96	2400.00	473467.34	0.00	473467.34
Feb-25	350	22.29	105	298	114432.00	42760	6.66	284781.60	0.959	5696.86	2400.00	395916.74	0.00	395916.74
Mar-25	350	25.12	137	298	114432.00	53485	6.7	358349.50	0.962	8958.74	2400.00	466222.76	142535.00	608757.76
April-25	350	32.27	153	298	114432.00	67245	6.7	450541.50	0.972	13516.25	2400.00	553857.25	80016.84	633874.09
May-25	350	37.86	166	298	114432.00	82045	6.7	549701.50	0.98	16491.05	2400.00	650042.45	80.76	650123.21
June-25	350	22.13	126	298	114432.00	44985	6.7	301399.50	0.949	4520.54	2400.00	413710.96	0.00	413710.96
July-25	350	20.17	115	298	114432.00	42315	6.68	282664.20	0.947	4239.96	2400.00	395256.24	0.00	395256.24
Aug-25	350	34.83	155	298	114432.00	75200	6.68	502336.00	0.975	15070.80	2400.00	604097.20	19306.35	623403.55
			189	298	1373184.00	56994.17		4569649.70	0.961	117239.19		5854394.51		
			Max demand	Bill demand	Total Demand charge			Total energy charge	Avg. PF	Total PF rebate		Total amount paid/annum		

Observations on electricity bills:

- a) Electricity is the main source of energy in JGEC. Average monthly electricity consumption of the plant is 56,994 kWh (Sept 2024- Aug 2025). Electricity cost for this period is Rs. 6.66, 6.68 & 6.70/kWh (as mentioned in the electricity bills) and all the energy saving calculations are based on this.
- b) In average monthly power factor of the plant is found to be 0.961, so plant got Rs. 1.17 lakh rebate on the power factor as per schedule of Tariff of WBSEDCL.
- c) At present maximum demand is 189.00 kVA but presently billing demand is 298.00 kVA (85% of 350 kVA). So if contract demand is reduced to 200 kVA expected annual monetary saving of Rs. 5.85 lakh can be achieved (Annexure B1).
- d) Unit charge varies seasonally from Rs. 6.66 to 6.70/kWh. So saving calculation purposes average value of Rs. 6.68/kWh will be considered.





Measured Electrical Parameters at LT PCC for 250 KVA Transformer 1 & 2:

Electrical power measurements were carried out at LT PCC of 250 kVA Transformer 1. During measurements, all electrical parameters, like Voltage profile, current profile, power factor, all power profile, individual harmonic level was critically studied.

Measured Electrical Parameters at LT PCC of Transformer

Electrical Measurements at LT PCC of 250 kVA Transformer 1								
Name	Date	Voltage (V)	Current (A)	PF	Power (kW)	Demand (kVA)	THDv (%)	THDi (%)
R rms	27-08-2025	242.6	38.4	0.95	8.85	9.32	1.30	6.60
Y rms	27-08-2025	241.9	69.9	0.94	15.89	16.91	1.30	4.10
B rms	27-08-2025	242.2	38	0.95	8.74	9.20	1.30	6.60
Electrical Measurements at LT PCC of 250 kVA Transformer 2								
Name	Date	Voltage (V)	Current (A)	PF	Power (kW)	Demand (kVA)	THDv (%)	THDi (%)
R rms	27-08-2025	236.9	148.6	0.96	33.80	35.20	1.30	3.40
Y rms	27-08-2025	234.5	127.5	0.93	27.81	29.90	1.30	3.20
B rms	27-08-2025	239.2	175.0	0.94	39.35	41.86	1.30	3.00

Findings on Electrical Parameters at LT PCC of 250 kVA Transformer 1 & 2:

- Total average Current Harmonic Distortion (%THDi) is 5.77% in the main feeders against transformer 1 and which is under permissible limit of 10%.
- Total average Current Harmonic Distortion (%THDi) is 3.2% in the main feeders against transformer 2 and which is under permissible limit of 10%.
- Voltage Harmonics Distortions (%THDv) in both the transformers are 1.3% and which is under permissible limit of 5%.
- During measurement it has been observed that current in Y phase of TR1 is higher than other two phases. Similarly current in B phase of TR2 is higher than other two phases. So routine monitoring is highly recommended and if happens in regular manner it is suggest to distribute the load in such a manner so that load is distributed equally. By this load unbalancing can be reduce which causes generation of (load unbalance) excessive heat, reduce efficiency, mechanical damage, and potential equipment failure.

Performance Evaluation of fresh water pumps:

Introduction:

At present there are 03 nos. of fresh water pumps which are used to fulfil the water demand in the premises. Capacity of each pump is 10HP. There is one overhead water reservoir having capacity of 300000 litre. In morning two pumps (P1, P2) run together approximately for 5.5 to 6 hrs. then in the afternoon one pump (P3) runs to meet the water demand (approx. 4 hrs). Again in the evening P1, P2 run together approximately for 1.5 hrs. and P3 for approx. 3.5 hrs. This cycle repeats every day. During field study power drawn by the running pump was measured by single phase analyser.



GOVERNMENT OF WEST BENGAL
Northern Mechanical Division
Public Health Engineering Directorate

Name of Scheme : JALPAIGURI ENGINEERING COLLEGE
W/S SCHEME, P/H NO - 1

1. Pump Discharge : 30 m³ / h
2. Pump Head : 55 m
3. Pump Capacity : 10 HP
4. Residual Chlorine at dosing point : 1.2 ppm
5. Chlorine Dosage : 60 gm / h

Daily Log of Motor and Pump

Date	Hours of Operation		Total running hours	Volt Meter Reading		Amp Meter Reading	Pressure Gauge Reading lbs/square inch 2 kg. cm.	Water level			Meter Reading	
	From Hrs.	To Hrs.		No. Load	On Load			SWL	PWL	Draw Down	Start K.W.H.	Stop K.W.
1.8.25	5 AM	9 AM	4 hr	410	400	15	3610	NO				
1.8.25	10 AM	2 PM	2 hr	410	400	15	3615	NO				
2.8.25	5 AM	9 AM	4 hr	400	390	14	3610	NO				
2.8.25	10 AM	2 PM	2 hr	400	390	14	3615	NO				
3.8.25	5 AM	9 AM	4 hr	400	390	14	3610	NO				
3.8.25	10 AM	2 PM	2 hr	410	400	14	3615	NO				
4.8.25	5 AM	9 AM	4 hr	410	400	14	3610	NO				
4.8.25	10 AM	2 PM	2 hr	400	390	14	3615	NO				
5.8.25	5 AM	9 AM	4 hr	410	400	14	3610	NO				
5.8.25	10 AM	2 PM	2 hr	410	400	15	3615	NO				
6.8.25	5 AM	9 AM	4 hr	410	400	14	3610	NO				
6.8.25	10 AM	2 PM	2 hr	410	390	14	3615	NO				
7.8.25	5 AM	9 AM	4 hr	410	400	14	3610	NO				
7.8.25	10 AM	2 PM	2 hr	410	400	15	3615	NO				
8.8.25	5 AM	9 AM	4 hr	410	400	14	3610	NO				
8.8.25	10 AM	2 PM	2 hr	410	390	14	3615	NO				
9.8.25	5 AM	9 AM	4 hr	400	390	15	3610	NO				
9.8.25	10 AM	2 PM	2 hr	410	400	15	3615	NO				
10.8.25	5 AM	9 AM	4 hr	410	400	14	3610	NO				
10.8.25	10 AM	2 PM	2 hr	410	390	14	3615	NO				
11.8.25	5 AM	9 AM	4 hr	410	400	14	3610	NO				
11.8.25	10 AM	2 PM	2 hr	410	400	15	3615	NO				
12.8.25	5 AM	9 AM	4 hr	410	400	15	3610	NO				
12.8.25	10 AM	2 PM	2 hr	400	390	14	3615	NO				
13.8.25	10 AM	2 PM	2 hr	410	400	15	3615	NO				
14.8.25	10 AM	2 PM	2 hr	400	390	14	3615	NO				
15.8.25	10 AM	2 PM	2 hr	410	400	15	3615	NO				

Performance Evaluation and proposed energy consumption of pumps:

Pump No.	Make	Motor (HP)	Motor (KW)	Overhead reservoir capacity (m3)	Daily operation (hrs.)	Estimated flow of pump (m3/hr)	Operating head (m)	Pump Efficiency	Avg. Operating Voltage (V)	Operating load in R, Y, B phase (A)	Avg. Operating load (A)	Yearly energy consumption (kWh)	Total Yearly energy consumption (kWh)
1	NA	10	7.46	350	7.0	28.64	25	26.15%	230	9.52, 9.69, 10.11	9.77	14645.41	44,982.34
2		10	7.46	350	7.0	28.64	25	26.15%	230			14645.41	
3		10	7.46	350	7.5	28	25	25.57%	230			15691.51	

Observations:

- Present operating pump efficiency is very low (26%) w.r.t to the operating head 25m (as per log book). Design pump head is 55m. So it is recommended to check the operating head in the summer session. If it is observed that operating head is almost same or below as of now then it is suggested to choose pumps nearly the operating head and flow. Then considerable amount of energy can be saved. Pump of desired head and flow can be chosen from <https://www.beestarlabel.com/SearchCompare>
- Current measurement was possible for one pump only. As the pumps are identical average of current is taken to calculate (approx.) the annual energy consumption.

Fan Cooling System:

Ceiling fans are installed in various rooms for cooling needs of this building complex. In order to assess the contribution of ceiling fans in the overall energy consumption, an inventory survey was undertaken to count the total number of fans installed in the premises. There are huge number of fans including ceiling, exhaust, Stand fan, and wall mount at different places. The findings of the survey are stated in the below:

Location	Room Name	No.	Type	Wattage (Including Ballast)	Total Wattage	Comments	
Girls Hostel Ground Floor	Mess	3	Ceiling Fan	75	225		
	Kitchen	2	Exhaust Fan	45	90		
	Room 102	2	Ceiling Fan	75	150		
	Room 105	1	Ceiling Fan	75	75		
	Room 107	2	Ceiling Fan	75	150		
	Room 108	1	Ceiling Fan	75	75		
	Room 109	1	Ceiling Fan	75	75		
1st Floor	Common Room	3	Ceiling Fan	75	225		
2nd Floor	Room 305	4	Ceiling Fan	75	300		
	Room 304	4	Ceiling Fan	75	300		
	Room 307	4	Ceiling Fan	75	300		
	Room 306	2	Ceiling Fan	75	150		
	Room 309	4	Ceiling Fan	75	300		
	Room 311	3	Stand Fan	65	195		
Administrative Building	Principal Room 300	7	Ceiling Fan	75	525		
	PA to Principal	2	Ceiling Fan	75	150		
	Principal Room Entrance	1	Ceiling Fan	75	75		
	Faculty Attendance Room	1	Ceiling Fan	75	75		
	Language Room (Conference)	13	Ceiling Fan	75	975		
	EC03	6	Ceiling Fan	75	450		
	ECE Gallery	6	Ceiling Fan	75	450		1 Not working
	EC02	6	Ceiling Fan	75	450		
	E-Waste	2	Stand Fan	65	130		
	ECE (HOD)	1	Ceiling Fan	75	75		
	Electronics Design Lab	4	Ceiling Fan	75	300		

DSP Lab	6	Ceiling Fan	75	450		
Maitreyee Biswas	2	Ceiling Fan	75	150		
Control s/s Lab	6	Ceiling Fan	75	450		
Electrical Conference Room	5	Ceiling Fan	75	375		
Library Room (Room No - EE - 5)	3	Stand Fan	65	195		
FY - 2	5	Ceiling Fan	75	375		
FY - 1	7	Ceiling Fan	75	525		
Subhasis Sir	1	Ceiling Fan	75	75		
Subrata Sir	1	Ceiling Fan	75	75		
Digital Electronics	4	Ceiling Fan old model	90	360		
<u>Microprocessor Lab - Entrance</u>	2	Ceiling Fan	75	150		
Microprocessor Lab	4	Ceiling Fan	75	300		
	7	Stand Fan	80	560		
Central Computer Centre (CC2)	5	Ceiling Fan	75	375		
CC - 1	5	Ceiling Fan	75	375		
Server Room	2	Ceiling Fan	75	150		
Battery Room	1	Ceiling Fan	75	75		
EE - 2	7	Ceiling Fan	75	525		
GKP Sir	2	Ceiling Fan	75	150		
HOD Sir (EE)	2	Ceiling Fan	75	150		
Power Electronics Lab	2	Ceiling Fan old model	90	180	1 Not working	
	4	Ceiling Fan	75	300		
Power System Lab - 2	1	Ceiling Fan old model	90	90		
	1	Ceiling Fan	75	75		
Circuit Network Lab	1	Ceiling Fan old model	90	90		
	3	Ceiling Fan	75	225		
Electrical and Electronics Measurements	1	Ceiling Fan old model	75	75		
	2	Ceiling Fan	75	150		

Digital Electric Drives	3	Ceiling Fan old model	90	270		
	1	Ceiling Fan	75	75		
Analog Electronics	1	Ceiling Fan old model	90	90		
	3	Ceiling Fan	75	225		
Machine - Lab	12	Ceiling Fan	75	900		
Power System - 1 Lab	2	Ceiling Fan old model	90	180		
	3	Ceiling Fan	75	225		
Basic Electrical Lab	3	Ceiling Fan	75	225		
EE - 4	6	Ceiling Fan	75	450		
EE - 3	6	Ceiling Fan	75	450		
2nd Year IT	6	Ceiling Fan	75	450		
EE - 1	8	Ceiling Fan	75	600		
CE - 5	6	Ceiling Fan	75	450		
CE - 4	8	Ceiling Fan	75	600		
Store Room	2	Ceiling Fan	75	150		
CE - 2	5	Ceiling Fan	75	375		
CE - 1	6	Ceiling Fan	75	450		
K.Kabiraj	1	Ceiling Fan	75	75		
Civil Meeting Room	2	Ceiling Fan	75	150		
G-1	6	Ceiling Fan	75	450		
ME - 3	5	Ceiling Fan	75	375		
S. Mondal	1	Ceiling Fan	75	75		
HOD Sir (Mechanical)	2	Ceiling Fan old model	90	180		
Seminar Room	2	Ceiling Fan old model	90	180		
Analysis Lab	1	Ceiling Fan	75	75		
A. Mahapatra	1	Ceiling Fan	75	75		
S.Roy	1	Ceiling Fan old model	90	90		
Dr. S Mukherjee	1	Ceiling Fan	75	75		
Measurement Lab	3	Ceiling Fan old model	90	270		
ME - 5	4	Ceiling Fan	75	300		
Dept. of Chemistry - 1	1	Ceiling Fan	75	75		

Dept. of Chemistry - 2	1	Ceiling Fan	75	75		
ME - 4	1	Exhaust Fan	65	65	Not Working	
	3	Ceiling Fan	75	225		
Research Lab	2	Exhaust Fan	65	130	1 Not working	
Extension- 1	1	Ceiling Fan old model	90	90	1 Not working	
2nd Floor	8	Ceiling Fan	75	600		
3rd Floor	2	Ceiling Fan old model	90	180		
DOM Lab	5	Ceiling Fan old model	90	450		
Library - Gr	8	Ceiling Fan	75	600		
	1	Ceiling Fan old model	90	90		
Extension - 2	2	Ceiling Fan old model	90	180		
Environment Engineering lab	2	Ceiling Fan	75	150		
	1	Ceiling Fan old model	90	90		
Devyani Subha	1	Wall Mount fan	65	65	1 Wall Mount fan not working	
Corridor				0		
CE - 3	3	Ceiling Fan old model	90	270	1 Not working	
B.C.Mondal	2	Ceiling Fan old model	90	180	1 Not working	
Geology Lab	1	Ceiling Fan old model	90	90		
	1	Ceiling Fan	75	75		
IEEE	2	Ceiling Fan	75	150	1 Not working	
Utpal Kumar Mondal	1	Ceiling Fan	75	75		
Dept. Head (CE)	2	Ceiling Fan	75	150		
Concrete Lab	2	Ceiling Fan	75	150		
	4	Ceiling Fan old model	90	360		
Structure Lab	3	Ceiling Fan old model	90	270		
Extension (illumination-58)	2	Ceiling Fan old model	90	180	1 Not working	
Soil Mechanics Lab	2	Ceiling Fan old model	90	180		

	Water Resource Engg. Lab	7	Ceiling Fan	75	525	
	Dr. John von neumann (Ground Floor)	7	Ceiling Fan	75	525	
	Advance of IT	4	Ceiling Fan	75	300	
	IT Seminar Room	6	Ceiling Fan	75	450	
	Head	2	Ceiling Fan	75	150	
	Dr. Swagata	1	Ceiling Fan	75	75	
	Smart lab hall	6	Ceiling Fan	75	450	
	CSE (2nd Floor) Staff room	1	Ceiling Fan	75	75	
	Gopa Mondal	2	Ceiling Fan	75	150	
	Jhuma dutta	2	Ceiling Fan	75	150	
	CSE-I	9	Ceiling Fan	75	675	
	CSE-II	9	Ceiling Fan	75	675	
	CSE-III	8	Ceiling Fan	75	600	
	HOD-CSE	4	Ceiling Fan	75	300	
	ME. Workshop	3	Ceiling Fan	75	225	4 fans required
	Heat Ty. Lab	4	Ceiling Fan	75	300	
	Fluid Machine lab	1	Ceiling Fan	75	75	
		2	Ceiling Fan old model	90	180	
3rd year Hostel	2 Sharing room	212	Stand Fan	65	13780	
	Common Room	4	Ceiling Fan old model	90	360	
		6	Ceiling Fan	75	450	
	Namaj Room	1	Ceiling Fan old model	90	90	
	Dining	12	Ceiling Fan	75	900	
4th Year Hostel	Single Room	180	Stand Fan	65	11700	
	Office	1	Ceiling Fan old model	90	90	
	Namaj Room	1	Ceiling Fan	75	75	
	Dining	10	Ceiling Fan	75	750	
3		Ceiling Fan old model	90	270		
Administrative Building	Account	5	Ceiling Fan	75	375	
	Extension	1	Ceiling Fan	75	75	
	Prabin Kar	2	Ceiling Fan	75	150	
	Proctor Room	1	Ceiling Fan	75	75	
	Hostel Office	1	Ceiling Fan	75	75	
	IT 1	1	Ceiling Fan old model	90	90	1 Not working

		5	Ceiling Fan	75	375	
	IT 2	6	Ceiling Fan	75	450	
	Case Section	8	Ceiling Fan	75	600	
	Establishment	2	Ceiling Fan	75	150	Exhaust fan not working
	Extension	3	Ceiling Fan	75	225	
	Building animation cell	14	Ceiling Fan	75	1050	
	TPO	3	Ceiling Fan	75	225	
	Activity Room	4	Ceiling Fan	75	300	
2nd year Hostel	3 Sharing Room	219	Stand Fan	65	14235	
	Common Room	8	Ceiling Fan	75	600	
	Namaj Room	1	Ceiling Fan	75	75	
	Dining	11	Ceiling Fan	75	825	
1st year Hostel	3 Sharing Room	219	Stand Fan	65	14235	
	Common Room	2	Ceiling Fan old model	90	180	
		3	Ceiling Fan	75	225	
	Namaj Room	1	Ceiling Fan	75	75	
	Dining	12	Ceiling Fan	75	900	

Observations:

In the college premises conventional ceiling fans (75W & 90W) are installed. So it is highly recommend to installed replace the same with energy efficient BLDC fans. A proposed amount 56090 kWh can be saved (Annexure B2).

Annexure – A5

Indoor Lighting System:

It is a well-known fact that adequate and proper lighting contributes both directly and indirectly towards productivity, safety and an improved work atmosphere. Proper lighting is a cumulative effect contributed by several factors such as elevation of light source from work area, angle of light source, luminaries around light source, stroboscopic effect etc. Considering all factors when providing general illumination to a large area is very difficult, however, efforts were made to include as many factors as possible in this study.

Approach:

Audit team has toured all possible areas to take note of distribution of lighting fixtures in various sections of the premises, type of lamps being used, quality of illumination and electrical load contributed by lighting. The illumination level was also measured primarily at working planes at various class rooms, labs, chambers etc.

A precision digital Lux meter was used to measure the illumination level at various sections of the building during working hours. Other performance indicators such as type of lamps used, luminaries, physical condition of lamps, use of day lighting, etc. were also noted down.

a) Lighting Load Inventory

To determine the total lighting load in individual building, a physical count of the number of light fixtures provided in different floors and sections of the different buildings was carried out. It was found during the survey that mainly 40 W/ 36W fluorescent tube lights and LED lamps are used in the building lighting.

b) Illumination Level

The illumination level was also measured primarily at working planes at various rooms of the buildings. Care was taken to reduce the effect of day lighting while taking the measurements.

Lighting inventory of JGEC:

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
1	Girls Hostel Ground Floor	Corridor	11	LED	20	170	
		Bathroom	3	LED	20	110	
		Mess	6	LED	20	95	
		Kitchen	2	LED BULB	9	118	
			3	GLS	100		
			1	LED	20		
		Room 102	1	LED	20	168	
			1	FTL (T-8)	36		
		Room 103	2	LED	20	182	
		Room 104	2	LED	20	178	
		Room 105	2	LED	20	185	
		Room 106	2	LED	20	188	
		Room 107	2	LED	20	178	
		Room 108	1	LED	20	142	
Room 109	2	LED	20	182			
Stair Case	1	FTL (T-12)	40	140			
2	Hostel First Floor	All Room	14	LED	20	170	Data available as per Ground floor Hostel Rooms
			1	FTL (T-8)	36		
			1	FTL (T-12)	40		
		Bathroom	6	LED	20	145	
		Corridor	5	LED	20	136	3 Not Working
			3	GLS	100		
		Common Room	4	LED	20	167	
Stair Case	1	FTL (T-12)	40	140			
3	Hostel Second Floor	All Room	14	LED	20	170	Data available as per Ground floor Hostel Rooms
			1	FTL (T-8)	36		
			1	FTL (T-12)	40		
		Bathroom	3	LED	20	150	
		Corridor	8	LED	20	136	
		Stair Case	1	FTL (T-12)	40	140	
4	Administrative Building	Principal Room	6	LED	20	310	
			1	Deem Light	5		

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
		PA to Principal	4	LED	20	107	
		Principal Room Entrance	1	FTL (T-8)	36	165	
		Faculty Attendance Room	1	FTL (T-8)	36	108	
		Language Room (Conference)	8	FTL (T-8)	36	220	
		EC03	2	LED	20	110	
			3	FTL (T-12)	40	88	
		ECE Gallery	7	FTL (T-12)	40		2 Not Working
		EC02	6	FTL (T-12)	40	128	
		ECE Corridor	12	FTL (T-8)	36		
			1	FTL (T-8)	36	112	
		E-Waste	1	FTL (T-12)	40	124	
			1	FTL (T-12)	40	124	
		ECE (HOD)	1	LED	20		
		Electronics Design Lab	2	LED	20	236	
			1	FTL (T-8)	36	132	
			1	FTL (T-12)	40		
		DSP Lab	4	LED	20		
			4	FTL (T-8)	36		
			5	FTL (T-12)	40		
		Maitreyee Biswas	3	FTL (T-12)	40		
		Central e/s Lab	7	FTL (T-12)	40		
		Electrical Conference Room	5	FTL (T-12)	40	85	
		Library Room (Room No - EE - 5)	5	FTL (T-12)	40		
		EE Entrance	6	FTL (T-12)	40		
		FY - 2	8	FTL (T-12)	40	330	
		FY - 1	11	FTL (T-12)	40	343	
		EE - 4	10	FTL (T-12)	40	175	

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
		Subhasis Sir	1	FTL (T-12)	40		
		Subrata Sir	1	FTL (T-12)	40		
		Digital Electronics	4	FTL (T-12)	40	95	
		Microprocessor Lab & Entrance	8	FTL (T-12)	40	340	
		Central Computer Centre (CC2)	16	FTL (T-12)	40	158	
		CC - 1	26	FTL (T-12)	40	244	4 Not Working
		Server Room	8	FTL (T-12)	40	140	
		Battery Room	2	FTL (T-12)	40	74	
		EE - 2	2	FTL (T-8)	36	170	
	2		FTL (T-12)	40			
	4		LED	20			
		GKP Sir	1	FTL (T-8)	36	184	
	1		LED	20			
		HOD Sir (EE)	6	FTL (T-12)	40	294	
		Ujjal Sir	1	FTL (T-8)	36		
	1		LED	20			
		Power Electronics Lab	12	FTL (T-8)	36	164	
	4		FTL (T-12)	40			
		Power System Lab - 2	2	FTL (T-8)	36	160	
	2		LED	20			
		Circuit Network Lab	4	LED	20	158	
	9		FTL (T-12)	40			
		Electrical and Electronics Measurements	3	LED	20	162	
	1		FTL (T-12)	40			
		Electrical Corridor	8	FTL (T-12)	40		
		Digital Electric Drives	4	LED	20	138	
	4		FTL (T-12)	40			
		Analog Electronics	2	LED	20	334	
	1		FTL (T-8)	36			
	1		FTL (T-12)	40			
		Machine - Lab	2	LED	20		

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments	
			8	FTL (T-8)	36			
			10	FTL (T-12)	40			
	Corridor Ground Floor		5	FTL (T-8)	36			
			2	FTL (T-12)	40			
	Power System - 1 Lab		4	FTL (T-12)	40	105		
			2	FTL (T-8)	36	76		
	Basic Electrical Lab		13	FTL (T-12)	40	79		
	EE - 4		4	LED	20	155		
			2	FTL (T-8)	36	175		
	EE - 3		3	LED	20	150		
			2	FTL (T-8)	36	132		
			1	FTL (T-12)	40	113		
	2nd Year IT		1	LED	20	150		
			8	FTL (T-8)	36	188		
			2	FTL (T-12)	40	100		
	EE - 1		5	FTL (T-8)	36	125		
			4	FTL (T-12)	40	120		
	CE - 5		3	LED	20	100		
			1	FTL (T-8)	36	103		
			3	FTL (T-12)	40			
	CE - 4		6	LED	20	147		
			4	FTL (T-8)	36	123		
			2	FTL (T-12)	40	174		
	Store Room		2	FTL (T-12)	40			
	CE - 2		6	LED	20	172		
			1	FTL (T-12)	40	270		
	CE - 1		3	LED	20	130		
			5	FTL (T-8)	36			
			1	FTL (T-12)	40			
	K. Kabiraj		1	LED	20	90		
			1	FTL (T-12)	40	77		

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
		Civil Meeting Room	1	LED	20	-	
		G-1	6	FTL (T-8)	36	88	
			3	FTL (T-12)	40	82	
		ME - 3	4	LED	20	118	
			3	FTL (T-8)	36	112	
			2	FTL (T-12)	40	110	
		S. Mondal	2	LED	20	-	
		HOD Sir (Mechanical)	2	FTL (T-8)	36	165	
			4	LED	20	178	
		CAD-CAM-LAB	1	LED	20	100	
			1	FTL (T-8)	36		
			5	FTL (T-12)	40		
		Seminar Room	3	LED	20		
			1	FTL (T-8)	36		
			2	FTL (T-12)	40	-	
		A. Mahapatra	2	LED	20	178	
		S.Roy	1	LED	20		
			1	FTL (T-8)	36	-	Not Working
		Dr. S Mukherjee	1	LED	20	131	
			1	FTL (T-8)	36	75	
		Measurement Lab	2	FTL (T-8)	36	100	
			4	FTL (T-12)	40	76	
		ME - 5	1	LED	20	58	
			5	FTL (T-8)	36	90	
		Corridor Mechanical	4	LED	20		
			7	FTL (T-12)	40		4 Not Working
		Dept. of Chemistry - 1	2	FTL (T-8)	36	80	
		Dept. of Chemistry - 2	2	FTL (T-8)	36	50	
		ME - 4	3	FTL (T-8)	36	113	
			1	FTL (T-12)	40		
			1	LED	20		

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
		Research Lab	1	FTL (T-8)	36	100	Lots of Spider Wave
			3	LED	20		
	Extension- 1		9	FTL (T-8)	36	-	
			9	FTL (T-12)	40		
	2nd Floor		2	FTL (T-8)	36	-	
			5	FTL (T-12)	40		
	3rd Floor		17	FTL (T-12)	40		
	DOM Lab		2	FTL (T-8)	36	155	6 Not Working
			10	FTL (T-12)	40	153	
	Library - Gr		6	LED	20	188	
			19	FTL (T-8)	36	200	
			4	FTL (T-12)	40	133	
	First Floor Library		1	LED	20	-	2 Not Working
			5	FTL (T-8)	36		
			6	FTL (T-12)	40		
	Extension - 2		3	FTL (T-8)	36	-	
	Environment Engineering lab		2	LED	20	-	
			4	FTL (T-12)	40		
	Devyani Subha		5	LED	20	208	2 Not Working
	Corridor		9	FTL (T-12)	40		
	CE - 3		3	LED	20	164	
	B.C.Mondal		2	LED	20		
			1	FTL (T-12)	40		
	Geology Lab		2	LED	20	217	
			3	FTL (T-8)	36	137	
	IEEE		8	LED	20		
	Utpal Kumar Mondal		2	LED	20	95	
	Dept. Head (CE)		4	FTL (T-12)	40	238	
	Corridor		6	FTL (T-12)	40		
	Concrete Lab		4	LED	20		
			5	FTL (T-8)	36		
			3	FTL (T-12)	40		

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
		Structure Lab	6	LED	20	122	
			3	FTL (T-8)	36	121	
			5	FTL (T-12)	40	110	
		Extension	6	FTL (T-8)	36		4 Not Working
			6	FTL (T-12)	40		
		Soil Mechanics Lab	1	LED	20	92	1 Not Working
			6	FTL (T-8)	36	88	
			3	FTL (T-12)	40	86	
		Water Resource Energy Lab	1	GLS	100	59	2 Not Working
			5	FTL (T-8)	36		
			4	FTL (T-12)	40		
		Corridor	6	LED	20		
			2	FTL (T-12)	40		
		Dr. John Von Neumann	8	LED	20	217	
			1	FTL (T-8)	36	129	
		Corridor	3	LED	20		
			1	FTL (T-12)	40		
		Advance of IT	3	LED	20	142	
			2	FTL (T-8)	36	146	
			3	FTL (T-12)	40	176	
		IT Seminar Room	2	LED	20		1 Not Working
			2	FTL (T-8)	36		
			4	FTL (T-12)	40		
		Head IT	2	FTL (T-12)	40		
		Dr. Swagata	2	FTL (T-12)	40	108	
		Smart Lab Hall	3	LED	20	115	
			1	FTL (T-8)	36	100	
			2	FTL (T-12)	40		
		Coridoor	6	FTL (T-12)	40		
		CSE Staff Room	1	LED	20	134	
			2	FTL (T-12)	40	153	
		Gopa Modal	2	LED	20	162	
			1	FTL (T-8)	36	172	

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
			1	FTL (T-12)	40	192	
		Juma Dutta	2	LED	20	134	
			2	FTL (T-12)	40	139	
		CSE - 1	5	FTL (T-8)	36	106	
			4	FTL (T-12)	40	84	
		CSE - 2	1	LED	20	170	
			4	FTL (T-8)	36	107	1 Not Working
			5	FTL (T-12)	40	97	
		CSE - 3	36	LED BULB	9	253	
		HOD - CSE	3	LED	20		
			3	FTL (T-8)	36		
		Corridor	8	LED	20		2 Not Working
		ME Workshop	12	LED BULB	9	70	
			1	FTL (T-12)	40	80	
		Heat Tf Lab	2	LED	20	25	
			2	GLS	100	28	
			4	FTL (T-8)	36	100	
			13	FTL (T-12)	40		
		Fluid Mechanics Lab	4	LED	20	298	
			4	FTL (T-12)	40	176	
		Accounts	8	LED	20		
		Extension	2	FTL (T-8)	36		
			1	FTL (T-12)	40		
		Prabir Kar	3	LED	20		
			1	FTL (T-12)	40		
		Corridor	3	LED	20		
			4	FTL (T-8)	36		
			2	FTL (T-12)	40		
		Cash Section	5	LED	20		
			3	FTL (T-8)	36		
		Proctor Room	4	LED	20		
		Proctor Corridor	11	FTL (T-12)	40		
		Hostel Office	2	LED	20		
			1	LED	9		

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
				BULB			
		IT - 1	4	LED	20		
			5	FTL (T-8)	36		
			1	FTL (T-12)	40		
		IT - 2	9	FTL (T-12)	40		2 Working
		Establishment	5	LED	20		
			4	FTL (T-8)	36		
		Extension	4	LED	20		
			2	LED BULB	9		
		Examination Hall	15	LED	20		
			1	FTL (T-8)	36		
			1	FTL (T-12)	40		
		Activity Room	14	FTL (T-12)	40		
		Corridor	9	LED	20		
		TPO	10	FTL (T-12)	40	334	
		Extension	8	LED	20	109	
5	LED BULB		9				
5	3rd Year Boys Hostel	Total Room	212	LED	20		
		Common Room	1	LED	20		
			7	FTL (T-8)	36		
		Office	1	FTL (T-12)	40		
		Library	1	FTL (T-8)	36		
		Namaj Room	2	FTL (T-8)	36		
			6	LED	20		
		Dining	8	FTL (T-8)	36		
			9	LED	20		
42	FTL (T-8)		36				
Corridor	39	FTL (T-12)	40				
6	4th Year Hostel	Total Room	180	LED	20		
			180	LED BULB	10		
		Common Room	4	LED	20		
			3	FTL (T-8)	36		
			2	FTL (T-12)	40		
		Office	1	FTL (T-8)	36		

Sl. No.	Location	Room Name	No.	Type	Wattage	LUX (Avg)	Comments
		Library	1	FTL (T-12)	40		
		Namaj Room	2	LED	20		
		Dining	5	LED	20		
			5	FTL (T-8)	36		
			3	FTL (T-12)	40		
7	2nd Year Hostel	Total Room	146	LED	20		
		Corridor	73	LED	20		
			10	FTL (T-8)	36		
			25	FTL (T-12)	40		
		Common Room	1	LED	20		
			3	FTL (T-8)	36		
			2	FTL (T-12)	40		
		Office	1	FTL (T-8)	36		
		Library	1	FTL (T-8)	36		
		Namaj Room	2	LED	20		
		Dining	4	LED	20		
			7	FTL (T-8)	36		
			2	FTL (T-12)	40		
8	1st Year Hostel	Total Room	146	LED	20		
		Corridor	66	LED	20		
			24	FTL (T-8)	36		
		Common Room	2	LED	20		
			4	FTL (T-8)	36		
		Office	1	FTL (T-8)	36		
		Library	1	FTL (T-12)	40		
		Namaj Room	2	FTL (T-8)	36		
		Dining	5	LED	20		
			6	FTL (T-8)	36		
1	FTL (T-12)		40				

Observations:

- a) Authority has start implementation of LED lights in the premises but conventional FTLs (T-12 & T-8) lights are installed in many cases.
- b) Total count of T-12 type FLTs are 531 nos. and T-8 are 360 nos.
- c) Average operating hours are 10 hrs.
- d) Considerable amount of energy can be saved by replacement of T-12 and T-8 types of FTLs by 20W LED tube lights (Annexure- B3)

Annexure – A5

AIR CONDITIONING SYSTEM

The main purposes of an Air Conditioning (AC) system are to help maintain good indoor air quality through adequate ventilation with filtration and provide thermal comfort. AC systems are one of the major energy consumers in the college. The choice of the AC system can save considerable amount of energy.

DESCRIPTION OF BUILDING AC

Data regarding the number of installed ACs has been collected from the premises (where ever possible). A total of 32 air conditioners of different cooling capacities have been found to be installed in the premises. Sample reading for 4 nos. of AC units were conducted and the results have been tabulated below:

Location wise installed ACs

Location	Star rating	Capacity (Ton)	Count
Principal room	non star	2	2
Conference (language room) room near principal chamber	3	2	4
Electronics lab	non star	1.5	1
	3	1.5	3
Maitreyee Biswas	3	1.5	1
Micro processor	3	1.5	1
Central computer lab	3	1.5	7
Server room	3	1.5	5
HOD	2	1.5	1
CAD-CAM	3	1.5	2
Dr. John Von Neumann	3	1.5	1
Advance IT	3	1.5	2
Account Section	3	1	2
Total			32

Location	Make	Star rating	Type	No	Duct Area (sq. m)	Rated Capacity (TR)	Avg. velocity (m/s)	Density of air	Room Temperature (deg C)	Room RH (%)	Duct Temperature	Duct RH (%)	Air Mass flow (kg/hr)	Inlet Enthalpy (h1) (kJ/kg)	Outlet Enthalpy (h2) (kJ/kg)	TR Developed	Input kW	kW/TR	Equivalent kW	EER
Conference (language room) room near principal chamber	Voltas	3*	split	4	0.045	2	2.60	1.14	25.30	73.30	13.20	89.50	480	63.7	34.6	1.11	2.26	2.04	3.887	1.72
Electronics design lab	Vertis plus	3*	split	1	0.045	1.5	2.88	1.14	24.90	72.80	13.10	89.30	532	61.71	34.33	1.15	1.70	1.47	4.056	2.39
HOD Room	Voltas	2*	split	1	0.042	1.5	2.68	1.14	25.50	73.90	12.10	91.30	463	65.28	30.4	1.28	1.84	1.44	4.488	2.44
Accounts Section	LLOYD	3*	split	1	0.038	1	2.68	1.14	20.90	61.00	9.50	91.00	417	60.2	31.8	0.94	1.15	1.23	3.296	2.87

Observations:

- 1) During field study it has been observed that most of the ACs are 3 star rated 1.5 TR old model split type.
- 2) Some non star rated 2 TR old model split type are also found.
- 3) Sample measurement of 4 nos. of split ACs were possible during site visit.
- 4) Energy conservation of present ACs are comparatively high. It is recommended to replace the present ACs with BEE star rated EE ACs to get considerable amount of energy savings (Annexure B4).

Energy Conservation Proposals

Recommendation 1

Reduction of contract demand from 350 kVA to 200 kVA

Background:

Present contractual demand is 350 kVA. As per the tariff order of the Hon'ble WBERC minimum demand charge is on 85% of contract demand (in this case, 85% of 350 kVA = 298 kVA).

So, if the contractual demand is reduced from 350 kVA to 200 kVA, then the monthly demand charge will get reduced accordingly.

Savings by reducing contractual demand will be as follows:-

SUMMARY OF SAVING BY REDUCING CONTRACT DEMAND:

- | | |
|--------------------------------|----------------------|
| ➤ Reduction of contract demand | : 350 kVA to 200 kVA |
| ➤ Annual Cost Saving Potential | : ₹5.83 Lakh |
| ➤ Investment | : ₹0.00 Lakh |
| ➤ Payback Period | : Immediate |

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Details of analysis are shown in below:

Month & Year	Contractual demand (kW)	Maximum demand (kVA)	Billing demand (kVA)	Demand Charge (Rs.)	Demand charges (Rs.)@Rs 384/kVA	New Contract demand (kVA)	85% of New contract demand (kVA)	New Billing demand (kVA)	New Demand charges (Rs.)@Rs 384/kVA	Savings (Rs.)	Total savings per annum (Rs.)
Sep-24	350.00	189.00	298.00	384.00	1,14,432.00	200.00	170.00	189.00	72,576.00	41,856.00	5,82,528.00
Oct-24	350.00	150.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
Nov-24	350.00	122.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
Dec-24	350.00	134.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
Jan-25	350.00	128.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
Feb-25	350.00	105.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
Mar-25	350.00	137.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
April-25	350.00	153.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
May-25	350.00	166.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
June-25	350.00	126.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
July-25	350.00	115.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	
Aug-25	350.00	155.00	298.00	384.00	1,14,432.00	200.00	170.00	170.00	65,280.00	49,152.00	

Recommendation 2

Replacement of old conventional fans with BEE star rated energy efficient BLDC fans

Background:

During study it is being observed that there is huge number of energy inefficient fans including ceiling, exhaust, Stand fan, and wall mount at different places for general cooling purposes. So it is being proposed to replace old energy inefficient fans (75W & 90W) with energy efficient BEE star rated BLDC fans. A considerable amount of energy can be saved. Details are mentioned below:

SUMMARY OF TECHNO ECONOMICS FOR ENERGY EFFICIENT BLDC FANS	
➤ Annual Energy Saving Potential	: 56090 kWh
➤ Annual Cost Saving Potential	: ₹3.75 Lakh
➤ Investment Required	: ₹14.88 Lakh
➤ Payback Period (average)	: 4.79 Years

Details of techno commercial analysis are shown below.

A. Recommendation Suggested		Replacement of ceiling fan with energy efficient BLDC fan	
B. Description of Existing System		476 nos. of conventional ceiling fan are being used to provide general cooling	
C. Description of Proposed System		Replacement conventional ceiling fan with energy efficient BLDC fans	
D. Energy Saving Calculation	Unit	Value	
Energy Consumption conventional ceiling fan	Watt	75	
Energy Consumption of BLDC fan	Watt	28	
Energy Saving per replacement	Watt	47	
Approximate no. conventional ceiling fan	Nos.	476	
Hours of Usage per day	Hours	10	
Annual working days	Days	230	
E. Cost Benefits			
Proposed Annual Energy Saving Potential	kWh	51,455.6	
Per Unit Energy Cost	Rs.	6.68	
Proposed Annual Monetary Savings	Rs.	3,43,723.41	
Investment / fixture	Rs.	2500	
Installation Cost (20% of product cost)	Rs.	250	
Total Investment	Rs.	13,09,000.00	
Simple Payback Period	Years	3.81	
ROI	%	26.26%	

A. Recommendation Suggested	Replacement of old ceiling fan with energy efficient BLDC fan	
B. Description of Existing System	65 nos. of old ceiling fan are being used to provide general cooling mainly in the labs	
C. Description of Proposed System	Replacement conventional ceiling fan with energy efficient BLDC fans	
D. Energy Saving Calculation	Unit	Value
Energy Consumption old ceiling fan	Watt	90
Energy Consumption of BLDC fan	Watt	28
Energy Saving per replacement	Watt	62
Approximate no. old ceiling fan	Nos.	65
Hours of Usage per day	Hours	5
Annual working days	Days	230
E. Cost Benefits		
Proposed Annual Energy Saving Potential	kWh	4,634.5
Per Unit Energy Cost	Rs.	6.68
Proposed Annual Monetary Savings	Rs.	30,958.46
Investment / fixture	Rs.	2500
Installation Cost (20% of product cost)	Rs.	250
Total Investment	Rs.	1,78,750.00
Simple Payback Period	Years	5.77
ROI	%	17.32%

Recommendation 3

Replacement of old conventional tube lights with energy efficient BEE star rated LED lights

Background:

During study it is being observed that there is huge number of energy inefficient tube lights (36W & 40W) are installed in the premises. So it is being proposed to replace energy inefficient tube lights (36W & 40W) with energy efficient BEE star rated tube lights. A considerable amount of energy can be saved. Details are mentioned below:

SUMMARY OF TECHNO ECONOMICS FOR LED TUBE LIGHTS:

- Annual Energy Saving Potential : 73094.4 kWh
- Annual Cost Saving Potential : ₹4.88 Lakh
- Investment Required Harmonic Filter : ₹2.16 Lakh
- Payback Period : 0.45 Year

A. Recommendation Suggested	Replacement of T- 12 type FTL with LED tube lights	
B. Description of Existing System	531 nos. of 40 W T-12 FTLs (Ballast consumption 12 W) are being used to provide general illumination to this building	
C. Description of Proposed System	Replacement of T-12 FTLs with 20 W LED tube lights	
D. Energy Saving Calculation	Unit	Value
Energy Consumption of a 40 W T-12 FTL	Watt	52
Energy Consumption of a LED tube light	Watt	20
Energy Saving per replacement	Watt	32
Approximate no. of 40 W T-12 FTL	Nos.	531
Hours of Usage per day	Hours	10
Annual working days	Days	270
E. Cost Benefits		
Annual Energy Saving Potential	kWh	45,878.4
Per Unit Energy Cost	Rs.	6.68
Annual Monetary Savings	Rs.	3,06,467.71
Investment / fixture	Rs.	220
Installation Cost (10% of product cost)	Rs.	22
Total Investment	Rs.	1,28,502.00
Simple Payback Period	Years	0.42
ROI	%	238.49%

A. Recommendation Suggested	Replacement of T- 8 type FTL with LED tube lights	
B. Description of Existing System	360 nos. of 36 W T-18 FTLs (Ballast consumption 12 W) are being used to provide general illumination to this building	
C. Description of Proposed System	Replacement of T-8 FTLs with 20 W LED tube lights	
D. Energy Saving Calculation	Unit	Value
Energy Consumption of a 36 W T-12 FTL	Watt	48
Energy Consumption of a LED tube light	Watt	20
Energy Saving per replacement	Watt	28
Approximate no. of 36 W T-12 FTL	Nos.	360
Hours of Usage per day	Hours	10
Annual working days	Days	270
E. Cost Benefits		
Annual Energy Saving Potential	kWh	27216
Per Unit Energy Cost	Rs.	6.68
Annual Monetary Savings	Rs.	181802.88
Investment / fixture	Rs.	220
Installation Cost (10% of product cost)	Rs.	22
Total Investment	Rs.	87,120.00
Simple Payback Period	Years	0.48
ROI	%	208.68%

Recommendation 4

Replacement of old Air Conditioners with energy efficient BEE star rated ACs

Background:

During study team has put effort to collect necessary information to identify the installed ACs at various locations in the premises. It has been observed that most of the installed ACs are 3 star rated split type old model ACs which consumes high energy i.r.t present EE ACs. So it has been recommended to install EE ACs to get considerable amount of energy savings. Details are mentioned below:

SUMMARY OF SAVING BY REDUCING INSTALATION OF EE ACs:

➤ Annual Energy Savings	: 37994.88 kWh
➤ Annual Cost Saving Potential	: ₹2.54 Lakh
➤ Investment	: ₹12.21 Lakh
➤ Avg. Payback Period	: 4.69 years

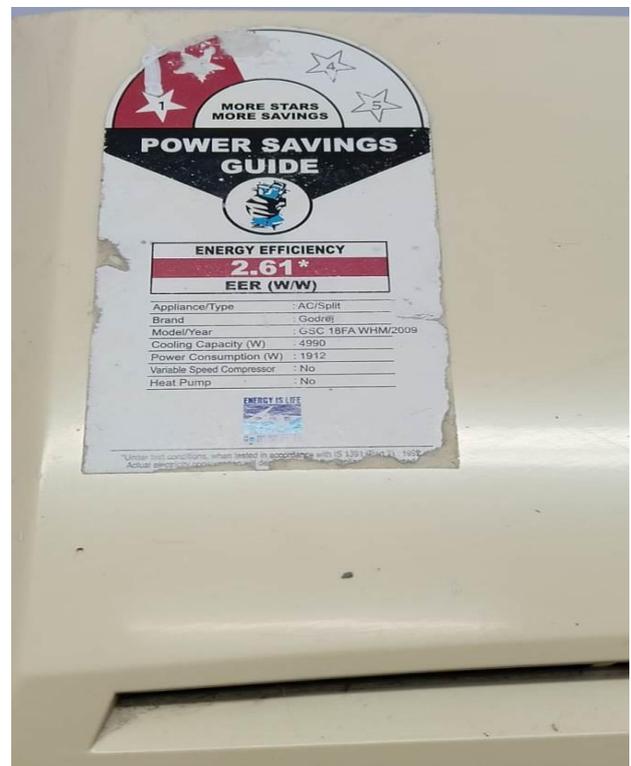
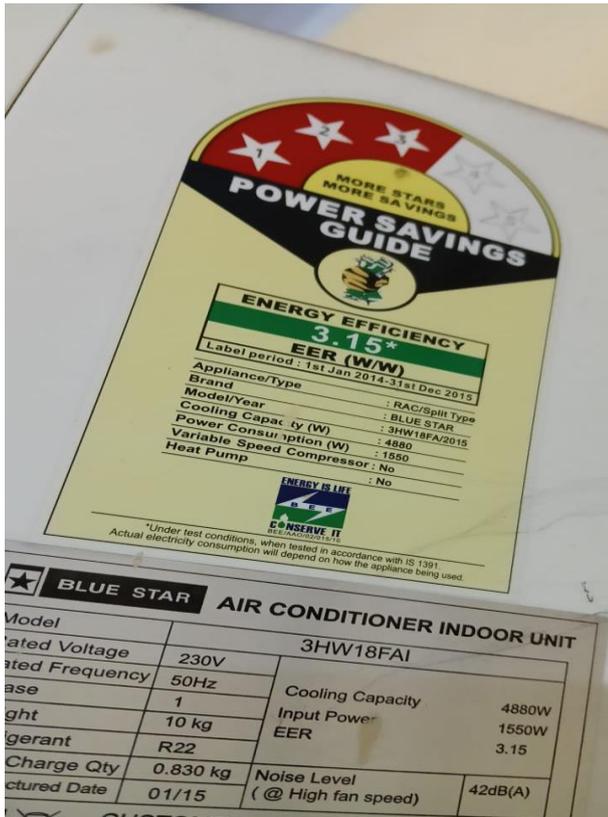
A. Recommendation Suggested	Replacement of 3 star 1.5TR old split ACs with EE 3 star 1.5TR inverter type split ACs	
B. Description of Existing System	24 nos. of 3 star 1.5TR old split ACs are being used to provide general cooling to the premises.	
C. Description of Proposed System	Replacement of present 3 star old ACs with EE 3 Star rated inverter type ACs	
D. Energy Saving Calculation	Unit	Value
Approx. energy Consumption of a present 3 star 1.5 TR ACs	Watt	1700
Approx. energy Consumption of a EE 3 star modern inverter type 1.5 TR ACs	Watt	1038
Approx. energy Saving per replacement	Watt	662
Approx. no. of ACs	Nos.	24
Hours of Usage per day	Hours	8
Annual working days	Days	220
E. Cost Benefits		
Annual Energy Saving Potential	kWh	27962.88
Per Unit Energy Cost	Rs.	6.68
Annual Monetary Savings	Rs.	186792.04
Investment / fixture	Rs.	35000
Installation Cost (10% of product cost)	Rs.	3500
Total Investment	Rs.	9,24,000.00
Simple Payback Period	Years	4.95
ROI	%	20.22%

A. Recommendation Suggested	Replacement of 2 TR old split ACs with EE 3 star 2 TR inverter type split ACs	
B. Description of Existing System	6 nos. of 2 TR old split ACs are being used to provide general cooling to the premises.	
C. Description of Proposed System	Replacement of present old 2 TR ACs with EE 3 Star rated 2 TR inverter type ACs	
D. Energy Saving Calculation	Unit	Value
Approx. energy Consumption of a present 2 TR ACs	Watt	2260
Approx. energy Consumption of a EE 3 star modern inverter type 2 TR ACs	Watt	1310
Approx. energy Saving per replacement	Watt	950
Approximate no. of ACs	Nos.	6
Hours of Usage per day	Hours	8
Annual working days	Days	220
E. Cost Benefits		
Annual Energy Saving Potential	kWh	10032
Per Unit Energy Cost	Rs.	6.68
Annual Monetary Savings	Rs.	67013.76
Investment / fixture	Rs.	45000
Installation Cost (10% of product cost)	Rs.	4500
Total Investment	Rs.	2,97,000.00
Simple Payback Period	Years	4.43
ROI	%	22.56%

N.B.

- Assumption has been taken that the energy consumption of non star rated 2TR ACs are nearly same with 3 star rated 2TR ACs.
- For energy savings calculation purposes average energy consumption has been considered for new 2TR BEE star rated ACs.

Snapshot of Star Label's at JGEC



BEE Star Labeling

 VOLTAS 183V VERTIS ELITE GOLD- 1(4503686)	 VOLTAS 183V VERTIS SMART ELITE GOLD(4503705)	 VOLTAS 183V VERTIS PLATINA- 1(4503753)
Type Room Air Conditioner (Variable Speed)	Type Room Air Conditioner (Variable Speed)	Type Room Air Conditioner (Variable Speed)
ISEER (Wh/Wh) 3.8	ISEER (Wh/Wh) 3.8	ISEER (Wh/Wh) 3.81
Nominal Marketing capacity (Ton) 1.5	Nominal Marketing capacity (Ton) 1.5	Nominal Marketing capacity (Ton) 1.5
Electricity Consumption (kWh/year) 1037.79	Electricity Consumption (kWh/year) 1037.79	Electricity Consumption (kWh/year) 1037.23
Valid Till Date 12/31/2025	Valid Till Date 12/31/2025	Valid Till Date 12/31/2025

 VOLTAS 243V VENUS PLUS(4503587)	 VOLTAS 243V VENUS LUXE(4503839)
Type Room Air Conditioner (Variable Speed)	Type Room Air Conditioner (Variable Speed)
ISEER (Wh/Wh) 4.05	ISEER (Wh/Wh) 4.25
Nominal Marketing capacity (Ton) 2	Nominal Marketing capacity (Ton) 2
Electricity Consumption (kWh/year) 1337.29	Electricity Consumption (kWh/year) 1283.53
Valid Till Date 12/31/2025	Valid Till Date 12/31/2025



-: End of Report:-