5. ENERGY AUDIT

5.1. Facility Description

The college receives power supply from the state electricity board (BESCOM – Bangalore Electricity Supply Company Limited) at HT 11 kV. The 11kV rated HT power supply is stepped down to LT 433V, by one number of 315 kVA rated transformer. The facility has availed power supply, with connection – RR. No ATBHT-132 with HT-2(C)-(i) tariff. Transformer unit installed inside college premises is as shown in the figure 5-1.

Figure 5-1: Transformer Yard

The name plate details of transformer are given in table 5-1.

S. No.	Description	Units	Details
1	Rated Capacity	kVA	315
2	Rated Voltage Prim/Sec	kV	11/0.433
3	Rated Current Prim/Sec	A	5.25/420
4	Type of Cooling	-	ONAN
5	Frequency	Hz	50
6	Impedance	-	4.64%
7	Phase	-	3
8	Make	-	Kiran Power

Table 5-1: Name plate details of transformer

The LT supply from the transformer is taken to the main distribution panel located inside the Electrical panel room via power cables.

Power supply cables from the electrical panel room is distributed to the various distribuition panels placed inside the campus. From the main electrical LT panel room, power supply is catered to individual areas. Electrical panel room is as shown in the figure 5-2.

Figure 5-2: Electrical Panel room

DG Sets:

One numbers of DG (Diesel Generator) set is used for backup power supply, during power failure from BESCOM. The DG sets are operated in manual mode. DG sets installed at the college premises is shown in the figure 5-3.

Figure 5-3: Diesel Generator (DG) sets

The name plate details of the DG sets are shown in the table 5-2.

S. No	Description	Unit	DG #1
1	Rated Capacity	kVA	140
2	AC Volt	V	415
3	AC Amp	A	340
4	Power Factor		0.8
5	Phase		3
6	Ambient	°C	40
7	Frequency	Hz	50
8	RPM		1500
9	Make		Powerica

Table 5-2: DG Set -Specifications

5.1.1. Tariff Structure

The sanctioned contract demand of the campus is 80 kVA at specified voltage of 11 kV. Electricity supply from BESCOM is billed under HT-2(C)-(i) schedule of tariffs. The tariff includes demand charges of Rs. 240 per kVA, and energy charges of Rs.7.20 per kWh.

The kVA demand charges @ Rs. 240/kVA of maximum demand recorded during the month or 85% of the contract demand, whichever is higher

5.1.2. Electricity Consumption Data

Details of electricity consumption for the last one year have been collected and Salient features of electrical energy details are given in table 5-3.

S. No.	Description	Unit	Details
1	Contract Demand	kVA	80
2	Demand Charges	Rs./kVA	240
3	Maximum Demand Recorded during last one year	kVA	65
4	Average Monthly Energy Consumption during last one year	kWh	20400
5	Average System Power Factor		0.9
6	Average Energy Charges considered for savings calculations	Rs./ kWh	7.20

Table 5-3: Electricity Bill Parameters

Figure 5-4 indicates the month wise recorded maximum demand and month wise energy consumption of the college campus for the last one year (Mar 2022 to Feb 2023).

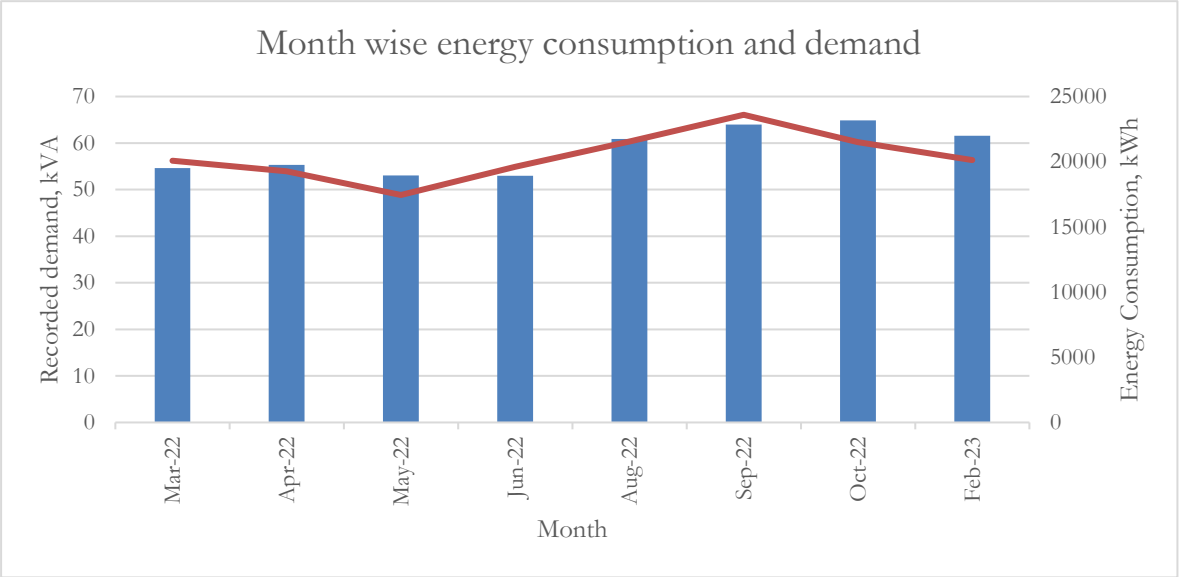


Figure 5-4: Month wise Maximum Demand and Energy Consumption

From the maximum demand curve, it was observed that maximum demand registered during the month of Oct 2022 was found to be 65 kVA and is the peak demand during the last one year of billing period. Average of registered maximum demand during April 2022 to March 2023 is 58 kVA.

From the month wise energy consumption profile, it was observed maximum energy consumption was registered during Sep 2022. Average monthly energy consumption is 20,400 kWh.

5.2. Institutional Initiatives for Energy Conservation

During the study, observations were carried out on the usage of the inventories in the college building premises. In the intension of saving the electricity, various measures have been adopted in the college. Computers and AC units are used only during the working hours, after completion of class hours – fans, lights, computers and AC units are found to be turned OFF. This practice is followed across the college premises (class rooms, labs, staff rooms, office rooms, library and auditoriums).

5.2.1. Day-light Integration

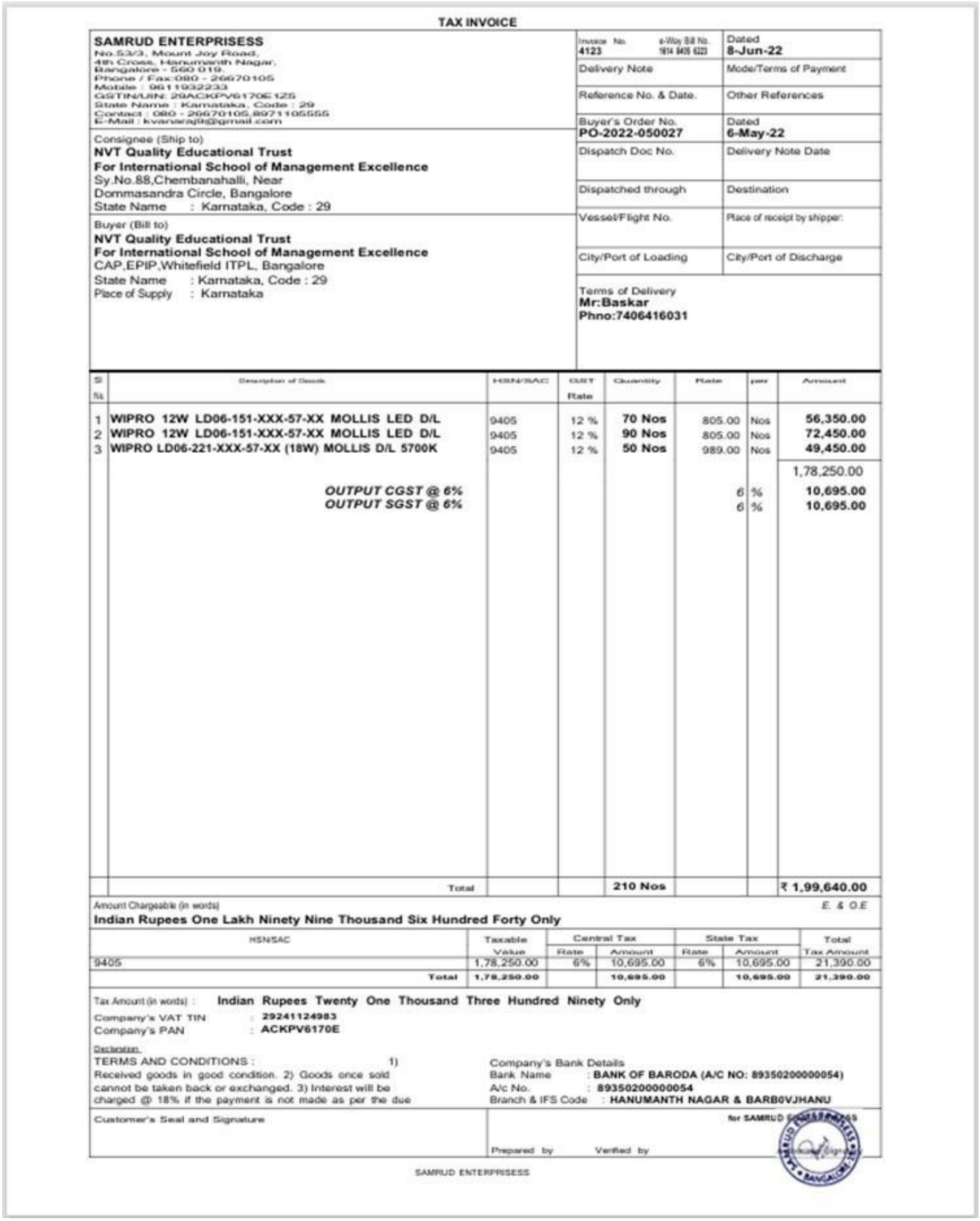
During the audit phase classrooms, Staff-rooms, computer lab, and library areas were surveyed for illumination levels and fresh air-circulation. It was observed most of the rooms are well ventilated and day-light integrated; sample photos are shown in figure 5-5.

Figure 5-5: Well-ventilated and day-light integrated class room and Library

5.2.2. Installation of LED lights

In the campus, LED fixtures are used to conserve energy. LED fixtures are used in the class rooms, staff-rooms, seminar hall corridors, hostel, dining area, etc. Sample photo of LED lamp used in the some of the locations of the college area are shown in figure 5-6 and sample LED purchase bill is shown in figure 5-7.

Figure 5-6: LED lights installed in Campus



TAX INVOICE

SAMRUD ENTERPRISESS
No.53/3, Mount Joy Road,
4th Cross, Hanumanth Nagar,
Bangalore - 560 019.
Phone / Fax:080 - 26670105
Mobile : 9611932233
GSTIN/UIN: 29ACKPV6170E1Z5
State Name : Karnataka, Code : 29
Contact : 080 - 26670105,8971105555
E-Mail : kvanaraj9@gmail.com

Invoice No. 4123 / e-Way Bill No. 1614 9405 6223	Dated 8-Jun-22
Delivery Note	Mode/Terms of Payment
Reference No. & Date.	Other References
Buyer's Order No. PO-2022-050027	Dated 6-May-22
Dispatch Doc No.	Delivery Note Date
Dispatched through	Destination
Vessel/Flight No.	Place of receipt by shipper:
City/Port of Loading	City/Port of Discharge

Consignee (Ship to)
NVT Quality Educational Trust
For International School of Management Excellence
Sy.No.88,Chembanahalli, Near
Dommasandra Circle, Bangalore
State Name : Karnataka, Code : 29

Buyer (Bill to)
NVT Quality Educational Trust
For International School of Management Excellence
CAP,EPIP,Whitefield ITPL, Bangalore
State Name : Karnataka, Code : 29
Place of Supply : Karnataka

Terms of Delivery
Mr:Baskar
Phno:7406416031

Sl No.	Description of Goods	HSN/SAC	GST Rate	Quantity	Rate	per	Amount
1	**WIPRO 12W LD06-151-XXX-57-XX MOLLIS LED D/L**	9405	12 %	**70 Nos**	805.00	Nos	**56,350.00**
2	**WIPRO 12W LD06-151-XXX-57-XX MOLLIS LED D/L**	9405	12 %	**90 Nos**	805.00	Nos	**72,450.00**
3	**WIPRO LD06-221-XXX-57-XX (18W) MOLLIS D/L 5700K**	9405	12 %	**50 Nos**	989.00	Nos	**49,450.00**
							1,78,250.00
	OUTPUT CGST @ 6%				6	%	**10,695.00**
	OUTPUT SGST @ 6%				6	%	**10,695.00**
	Total			**210 Nos**			**₹ 1,99,640.00**

Amount Chargeable (in words) E. & O.E
Indian Rupees One Lakh Ninety Nine Thousand Six Hundred Forty Only

HSN/SAC	Taxable Value	Central Tax Rate	Central Tax Amount	State Tax Rate	State Tax Amount	Total Tax Amount
9405	1,78,250.00	6%	10,695.00	6%	10,695.00	21,390.00
Total	**1,78,250.00**		**10,695.00**		**10,695.00**	**21,390.00**

Tax Amount (in words) : **Indian Rupees Twenty One Thousand Three Hundred Ninety Only**
Company's VAT TIN : **29241124983**
Company's PAN : **ACKPV6170E**

Declaration
TERMS AND CONDITIONS : 1) Received goods in good condition. 2) Goods once sold cannot be taken back or exchanged. 3) Interest will be charged @ 18% if the payment is not made as per the due

Company's Bank Details
Bank Name : **BANK OF BARODA (A/C NO: 89350200000054)**
A/c No. : **89350200000054**
Branch & IFS Code : **HANUMANTH NAGAR & BARB0VJHANU**

Customer's Seal and Signature

for SAMRUD ENTERPRISESS

Prepared by Verified by

SAMRUD ENTERPRISESS

Figure 5-7: LED lights purchase bill

5.2.3. Installation of Heat Pump

Heat pump technology has been used for the hot water purpose in hostel and is integrated with the solar water heater. The integrated hot water system is shown in figure 5-8.

Figure 5-8: Integrated recirculation type -Hot water system

5.2.4. Installation of Solar Water Heater

Solar water heaters are installed in hostel terrace for generating hot water. It is integrated with heat pump system. Sample photo of solar water heater used in the campus are shown in figure 5-9.

Figure 5-9: Use of Solar Water Heater

The cost savings by installation of solar water heater are given in table 5-4.

S. No.	Description	Unit	Values
1	Solar water heater installed	L	3000
2	Total amount of heat produced	kCal/hr	90000
3	Electricity equivalent	kWh	104.7
4	No. of working days per year	days	250.0
5	Annual electricity savings	kWh	26162.8
6	Average electricity cost	Rs./kWh	8.25
7	Annual cost savings achieved per year	Rs. lakh/year	2.2
8	CO2 mitigations per year	Tons/year	22.2

Table 5-4: Annual cost savings by installation of Solar Water Heater

5.2.5. Installation of UPS for power backup

UPS (Un-interrupted Power Supply) system is installed in the college premises for power backup. Six numbers of UPS (3 kVA, 5 kVA, 10 kVA, 11 kVA, 20 kVA and 25 kVA rated each one number), have been installed to provide backup power supply, during power failure from grid. The picture of UPS and battery installed in the college is shown in figure 5-10.

Figure 5-10: UPS and batteries

5.2.6. Procurement of LED/LCD monitors

LED/LCD monitors are used for all the desktop computers in staff rooms and in computer labs. Sample photos of the computer labs are as shown in the figure 5-11.

Figure 5-11: Use of LED monitors in the computer labs

5.2.7. Use of Electrical Safety Mats

Electrical safety mats were used placed near each electrical panel to avoid electrical shock risk. The image of the electrical safety mats used is shown in figure 5-12.

Figure 5-12: Electrical safety mats near electrical panel

5.2.8. Awareness posters on Energy conservation

Sign boards on energy conservation are kept in the campus to create awareness among the staff and students to conserve electricity. Posters stating - 'Save Energy', 'Switch off light and fan when not in use' were placed at the college.

The sample images of awareness poster on energy conservation is shown in figure 5-13.

Figure 5-13: Awareness posters on Energy conservation