

# Energy Audit Report 2022-23



**University of North Bengal**

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**The Energy Audit Team**

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**Er. Kunal Chowdhury**

Office of the Chief Engineer

University of North Bengal

### Certificate

This is to certify that the energy audit in the electrical utilities of the University of North Bengal has been carried out by our team in order to identify the energy consumption patterns and identify opportunities to improve the energy efficiency on the University campus.



Signature

(Er. Kunal Chowdhury)  
Assistant Engineer (Elec.)  
University of North Bengal



Signature

(Dr. Tamal Sarkar)



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(Dr. Arunava Bhadra)



## Summary

The energy audit adopts a constructive approach focused on the continuous enhancement of energy efficiency. It provides essential data as a foundation for an all-encompassing energy conservation strategy, primarily involving the examination of energy usage and evaluation of energy-saving solutions while prioritizing the maintenance or enhancement of human comfort, health, and safety.

This report delves into the energy consumption patterns of the university campus, offering a comprehensive analysis of the gathered data. Collaborating with the Engineering Branch staff, our team conducted the analysis. To compare energy consumption during the summer and winter seasons for the years 2022–23, a meticulous audit of energy usage across various sectors on the university campus has been compiled. To gauge the progress following the implementation of recommendations from the prior energy audit, we also analyze data from the two preceding years.

The report encompasses a range of potential recommendations to conserve and optimally utilize available resources. Additionally, suggestions for daily practices related to common electrical appliances are provided, aiming to reduce energy consumption without disrupting regular activities.

**Introduction:** The University of North Bengal is comprised of three campuses. The primary campus is situated alongside Asian Highway 2 in the Darjeeling district of West Bengal, near Siliguri, covering an area of approximately 331 acres. Another campus spans 36.14 acres in Jalpaiguri, while the third is located in Salt Lake, Kolkata. The layout of the main campus is meticulously designed to cater to academic, administrative, sports/recreational, residential, and various other needs.

Various Departments, Research Centers, and Administrative Branches are accommodated in buildings scattered across the main campus. This includes three hostels for girls and two for boys. The campus features a range of infrastructure facilities such as a Health Center, Gymnasium, Sports Grounds, Guest houses, auditoriums, canteens, faculty club, bank, post office, and library. It is primarily a residential campus, providing housing for teachers, officers, and non-teaching employees.

The University of North Bengal contends with substantial energy consumption across its campuses, incurring an annual cost of around two crore rupees. Both environmental and economic considerations underscore the necessity for efforts to curtail the energy consumption on campus while ensuring the safety, health, and comfort of individuals.

The primary objective of the energy audit is to enhance the energy efficiency of the NBU campus. An energy audit is a systematic process involving the assessment and analysis of energy usage and identifying opportunities for efficiency improvements in buildings, facilities, or industrial processes. This process encompasses evaluating consumption patterns, pinpointing areas of wastage, and recommending strategies to enhance overall energy performance without compromising safety and comfort.

The motivation for an energy audit arises from the desire to reduce costs, improve energy efficiency, comply with regulations, mitigate environmental impact, optimize equipment performance, manage risks, and create healthier and more comfortable environments. Conducting energy audits in educational institutions allows for a better understanding of energy and fuel usage, identifying waste and areas for improvement.

Energy management remains a critical aspect of cost reduction, particularly due to its impact on expenses. Monitoring energy consumption provides guidance for cost reduction, preventive maintenance, and essential quarterly activities. Such research helps maintain focus on changes in electricity costs, assess the availability and reliability of electricity, determine the future energy mix, evaluate energy conservation technologies, and upgrade energy-saving equipment.

**Existing practices for saving energy consumption in the University:**

1. Replacement of incandescent bulbs and fluorescent tube lights with energy-efficient light-emitting diode (LED) bulbs/tubes.
2. Replacement of old fans with new energy-efficient fans.

# ***ENERGYMANAGEMENT***

## **Main Campus of NBU:**

<b>Contract Demand with WBSEDCL</b>	1000 KVA		
<b>Transformer Capacity</b>	1065 KVA		
<b>Diesel Generator Set Capacity in campus</b>	900 KVA		
<b>Electricity Consumption per year</b>	<b>2020-2021</b>	<b>2021-2022</b>	<b>2022-2023</b>
<b>Electricity Consumption per year in Kwh</b>	1422188 Kwh	1663850 Kwh	2128117 Kwh
<b>Electricity Cost per year in Rs.</b>	Rs. 1,46,44,442	Rs. 1,60,02502	Rs. 1,94,30,148
<b>Diesel Consumption per year</b>	1950 Ltrs	1400 Ltrs	900 Ltrs

## **Jalpaiguri Campus of NBU:**

<b>Contract Demand with WBSEDCL</b>	400 KVA
<b>Transformer Capacity</b>	250 KVA
<b>Diesel Generator set Capacity on campus</b>	At present no DG service at the campus
<b>Electricity Consumption per year</b>	2022-2023
<b>Electricity Consumption per year in Kwh</b>	73200 kwh
<b>Electricity Cost per year in Rs.</b>	Rs. 27,39,984



***Data analysis and visualization***

Details of the approximate load distribution at NBU main Campus																
YEAR 2020-2021																
Sl.No.	Department	No. of Tubes	No. of A/C	No. of Fans	No. of Projectors	No. of Photocopiers	Computers + Printers	Water Purifiers	LED tube + bulbs	Geysers	Sodium vapor	LED Street light	1HP/ 1.5 HP	2HP	3HP	5HP
1	Arts Department	952	16	632	32	33	297	27	454	NA	-	-	-	-	-	-
2	Science Department	1369	76	819	15	22	365	28	410	NA	-	-	-	-	-	-
3	Centres	129	6	100	2	4	35	3	36	NA	-	-	-	-	-	-
4	Service & maintenance Departments	13	1	27	0	4	15	2	41	NA	-	-	-	-	-	-
5	Library & Library Science	431	5	257	1	6	82	4	0	NA	-	-	-	-	-	-
6	Administrative	0	26	259	3	29	141	5	444	1	-	-	-	-	-	-
7	Guest House	563	14	209	NA	NA	1	11	37	18	-	-	-	-	-	-
8	PG Hostels	1421	NA	907	NA	NA	NA	31	0	0	-	-	-	-	-	-
9	RS Hostel	251	NA	79	NA	NA	NA	6	0	0	-	-	-	-	-	-
10	Faculty Club & Mancho	313	NA	140	NA	NA	NA	1	74	NA	-	-	-	-	-	-
11	Museum	204	NA	40	NA	1	3	1	0	NA	-	-	-	-	-	-
12	Residence for Teachers, Officers & Staffs	1025	5	532	0	0	145	120	760	55	-	-	-	-	-	-
13	Street Light	-	-	-	-	-	-	-	-	-	54	390	4	2	2	5
14	Pump	9	-	-	-	-	-	-	9	-	-	-	-	-	-	-
Total		6671	149	4001	53	99	1084	239	2256	74	54	390	4	2	2	5
Total Consumption in Watt		240156	298000	300075	3710	64350	216800	7170	40608	148000	10800	27300	2942	2942	4400	18390
Per day Consumption in Watt-hr (8 Hrs/ day). (Projectors are not use for 8 hrs per day we assume that may be used 5 hrs per day)		1921248	2384000	2400600	29680	514800	1734400	57360	324864	1184000	86400	218400	23536	23536	35200	147120
Per day Consumption in Kwh		1921.248	2384	2400.6	29.68	514.8	1734.4	57.36	324.864	1184	86.4	218.4	23.536	23.536	35.2	147.12
Per month Consumption in Kwh (Avg. 22 working day for departments and 30 days for street light). Projectors are not use for daily basis we assume projector may be used 10 days/month)		42267.456	52448	52813.2	296.8	11325.6	38156.8	1261.92	7147.008	26048	2592	6552	706.08	706.08	1056	4413.6
Per month Consumption at Summer Season in Kwh (April to October Total days of summer = 214 days we assume that total avg working days in summer season 120 days. For street lights total 214 days)		230549.76	286080	288072	-	61776	208128	6883.2	38983.68	-	18489.6	46737.6	5036.704	5036.704	7532.8	31483.68

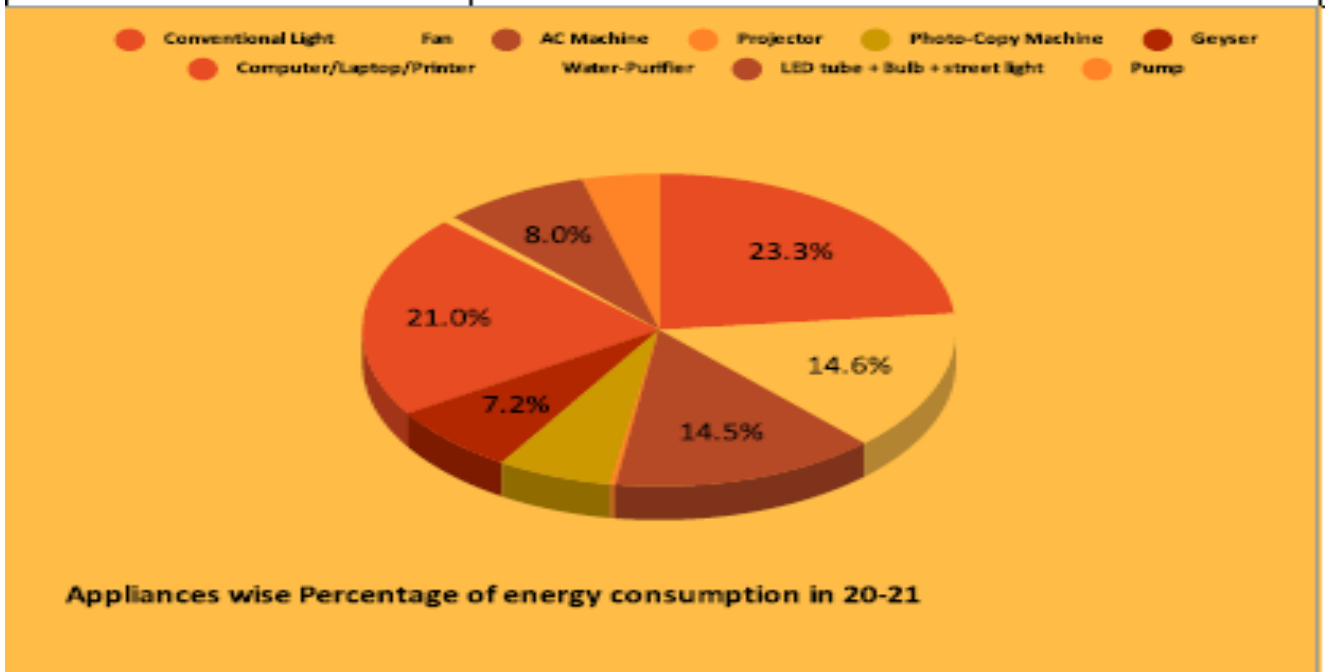
Per month Consumption at Winter Season in Kwh (November to March Total days of Winter = 151 days we assume that total avg working days in summer season 120 days. For street lights total 151 days)	230549.76	-	-	-	61776	208128	6883.2	38983.68	142080	13046.4	32978.4	3553.936	3553.936	5315.2	22215.12
Per year Consumption in Kwh (240 working days for light, water purifier, computer, 160 day for fan & AC, 120 days for geyser, 200 days for projector and 365 days for street lights)	461099.52	286080	288072	5936	123552	416256	13766.4	77967.36	142080	31536	79716	8590.64	8590.64	12848	53698.8

Load calculation of year 2020-2021	Unit in Kwh	Total Cost in Rs.
Total load consumption (Kwh) in summer season	1234789.728	13706165.98
Total load consumption (Kwh) in Winter season	769063.632	8375102.952
Total load consumption (Kwh) of 1 year	2003853.36	22081268.93

The above tabular sheet shows the total equipment of the various departments in the year 2020-21. Those may be in operation for an average of 8 hours per day. The tabular sheet also showed the approximate calculation of annual consumption and cost. The WBSEDCL imposes HT tariff differently in different seasons (i.e., summer, monsoon, and winter). We present the percentage of uses of various equipment year-wise in a pie chart, which is given below.

**Percentage of present Energy Consumption by various Electrical Appliances wise  
in the Year of 2020-2021 (Approx.)**

Equipment	Energy Consumption in Kwh/year (20-21)
Conventional Light	461099.5
Fan	288072
AC Machine	286080
Projector	5936
Photo-Copy Machine	123552
Geyser	142080
Computer/Laptop/Printer	416256
Water-Purifier	13766
LED tube + Bulb + street light	157683
Pump	83728.2



It is found from the above pie chart that in the year 2020–2021, the energy consumed by conventional light (incandescent bulbs and fluorescent tube lights) is 23.3% of the total energy usage, whereas LED light consumes only 8% of the total utilized energy.

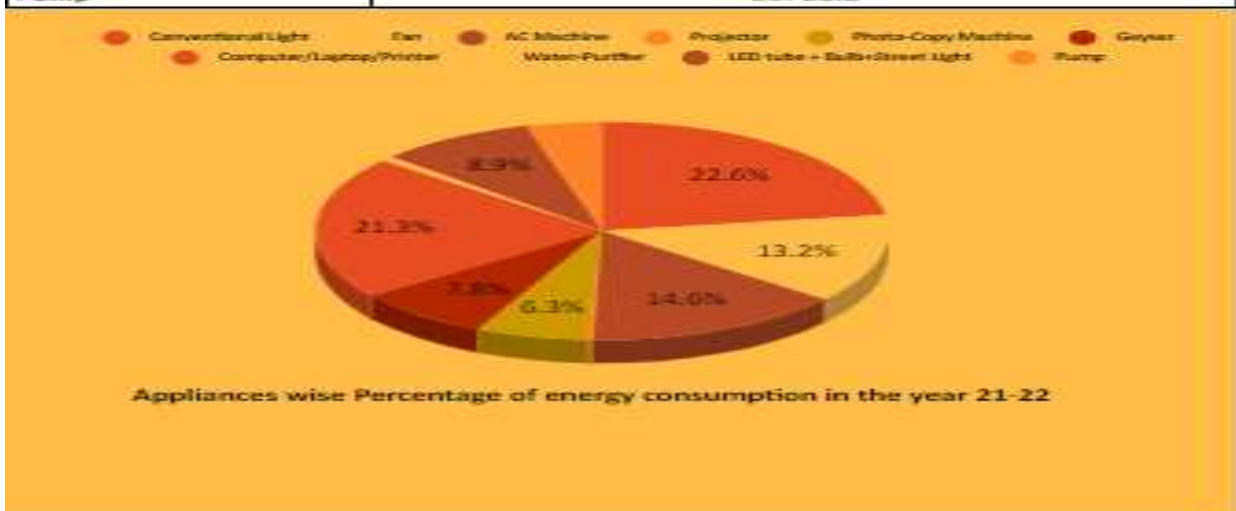
Details of the approximate load distribution at NBU main Campus																
YEAR 2021-2022																
Sl.No.	Department	No. of Tubes	No. of A/C	No. of Fans	No. of Projectors	No. of Photocopiers	Computers + Printers	Water Purifiers	LED tube+bulb	Geysers	Sodium vapor	LED Street light	1HP/ 1.5 HP	2HP	3HP	5HP
1	Arts Department	942	16	632	32	33	297	27	464	NA	-	-	-	-	-	-
2	Science Department	1285	76	819	15	22	365	28	583	NA	-	-	-	-	-	-
3	Centres	127	6	100	2	4	35	3	38	NA	-	-	-	-	-	-
4	Service & maintenance Departments	8	1	27	0	4	15	2	47	NA	-	-	-	-	-	-
5	Library & Library Science	370	5	257	1	6	82	4	61	NA	-	-	-	-	-	-
6	Administrative building	0	26	259	3	29	141	5	444	1	-	-	-	-	-	-
7	Guest House	549	14	209	NA	NA	1	11	51	18	-	-	-	-	-	-
8	PG Hostels	1421	NA	907	NA	NA	NA	31	0	0	-	-	-	-	-	-
9	RS Hostel	251	NA	79	NA	NA	NA	6	0	0	-	-	-	-	-	-
10	Faculty Club & Mancho	313	NA	140	NA	NA	NA	1	74	NA	-	-	-	-	-	-
11	Museum	204	NA	40	NA	1	3	1	0	NA	-	-	-	-	-	-
12	Residence for Teachers, Officers & Staffs	930	5	480	0	0	145	120	760	60	-	-	-	-	-	-
13	Street Light	-	-	-	-	-	-	-	-	-	24	420	4	2	2	5
14	Pump	9	-	-	-	-	-	-	9	-	-	-	-	-	-	-
Total		6400	149	3949	53	99	1084	239	2522	79	24	420	4	2	2	5
Total Consumption in Watt		230400	298000	268532	3710	64350	216800	7170	45396	158000	4800	29400	2942	2942	4400	18390
Per day Consumption in Watt-hr (8 Hrs/ day). <i>(Projectors are not use for 8 hrs per day we assume that may be used 5 hrs per day)</i>		1843200	2384000	2148256	29680	514800	1734400	57360	363168	1264000	38400	235200	23536	23536	35200	147120
Per day Consumption in Kwh		1843.2	2384	2148.256	29.68	514.8	1734.4	57.36	363.168	1264	38.4	235.2	23.536	23.536	35.2	147.12
Per month Consumption in Kwh <i>(Avg. 22 working day for departments and 30 days for street light). Projectors are not use for daily basis we assume projector may be used 10 days/month)</i>		40550.4	52448	47261.632	296.8	11325.6	38156.8	1261.92	7989.696	27808	1152	7056	706.08	706.08	1056	4413.6
Per month Consumption at Summer Season in Kwh <i>(April to October Total days of summer = 214 days we assume that total avg working days in summer season 120 days. For street light total 214 days)</i>		221184	286080	257790.72	-	61776	208128	6883.2	43580.16	-	8217.6	50332.8	5036.704	5036.704	7532.8	31483.68
Per month Consumption at Winter Season in Kwh <i>(November to March Total days of Winter = 151 days we assume that total avg working days in summer season 120 days. For street lights total 151 days)</i>		221184	-	-	-	61776	208128	6883.2	43580.16	151680	5798.4	35515.2	3553.936	3553.936	5315.2	22215.12
Per year																

Consumption in Kwh (240 working days for light, water purifier, computer, 160 day for fan & AC, 120 days for geyser, 200 days for projector and 365 days for street lights)	442368	286080	257790.72	5936	123552	416256	13766.4	87160.32	151680	14016	85848	8590.64	8590.64	12848	53698.8
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Load calculation of year 2021-2022	Unit in Kwh	Total Cost in Rs.
Total load consumption (Kwh) in summer season	1193062.368	13242992.28
Total load consumption (Kwh) in Winter season	769183.152	8376404.525
Total load consumption (Kwh) of 1 year	1962245.52	21619396.81

**Percentage of present Energy Consumption by various Electrical Appliances wise in the Year of 2021-2022 [Approx.]**

Equipment	Energy Consumption in Kwh/year (21-22)
Conventional Light	442368
Fan	257791
AC Machine	286080
Projector	5936
Photo-Copy Machine	123552
Geyser	151680
Computer/Laptop/Printer	416252
Water Purifier	13766
LED tube + Bulb+Street Light	173008
Pump	83728.2



This pie chart shows that the number of LED lights has an 8.9% increase from the previous year (2021-2022).

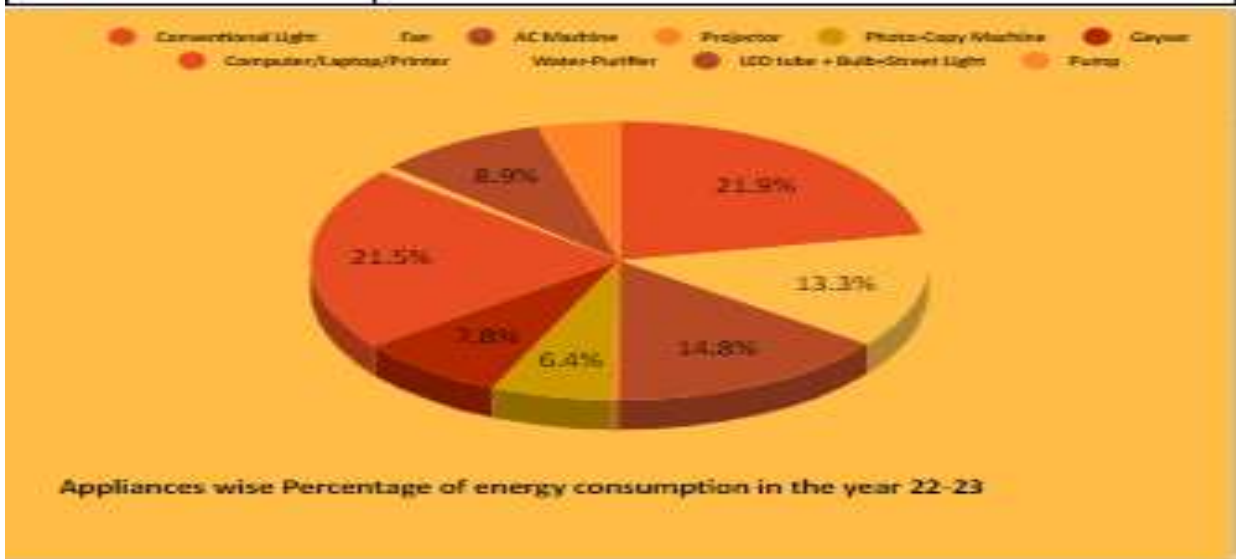
Details of the approximate load distribution at NBU main Campus																
YEAR 2022-2023																
Sl.No.	Department	No. of Tubes	No. of A/C	No. of Fans	No. of Projectors	No. of Photo-copiers	Computers + Printers	Water Purifiers	LED tube+ bulb	Geysers	Sodium vapor	LED Street light	1HP/ 1.5 HP	2HP	3HP	5HP
1	Arts Department	942	16	632	32	33	297	27	464	NA	-	-	-	-	-	-
2	Science Department	1285	76	819	15	22	365	28	583	NA	-	-	-	-	-	-
3	Centers	127	6	100	2	4	35	3	38	NA	-	-	-	-	-	-
4	Service & maintenance Departments	8	1	27	0	4	15	2	47	NA	-	-	-	-	-	-
5	Library & Library Science	370	5	257	1	6	82	4	61	NA	-	-	-	-	-	-
6	Administrative building	0	26	259	3	29	141	5	444	1	-	-	-	-	-	-
7	Guest House	549	14	209	NA	NA	1	11	51	18	-	-	-	-	-	-
8	PG Hostels	1421	NA	907	NA	NA	NA	31	0	0	-	-	-	-	-	-
9	RS Hostel	251	NA	79	NA	NA	NA	6	0	0	-	-	-	-	-	-
10	Faculty Club & Mancho	313	NA	140	NA	NA	NA	1	74	NA	-	-	-	-	-	-
11	Museum	204	NA	40	NA	1	3	1	0	NA	-	-	-	-	-	-
12	Residence for Teachers, Officers & Staffs	930	5	480	0	0	145	120	760	65	-	-	-	-	-	-
13	Street Light	-	-	-	-	-	-	-	-	-	24	420	-	-	-	-
14	Pump	9	-	-	-	-	-	-	9	-	-	-	4	2	2	5
<b>Total</b>		6400	149	3949	53	99	1084	239	2522	84	24	420	4	2	2	5
<b>Total Consumption in Watt</b>		230400	298000	268532	3710	64350	216800	7170	45396	168000	4800	29400	2942	2942	4400	18390
<b>Per day Consumption in Watt-hr (8 Hrs/ day). (Projectors are not use for 8 hrs per day we assume that may be used 5 hrs per day)</b>		1843200	2384000	2148256	29680	514800	1734400	57360	363168	1344000	38400	235200	23536	23536	35200	147120
<b>Per day Consumption in Kwh</b>		1843.2	2384	2148.256	29.68	514.8	1734.4	57.36	363.168	1344	38.4	235.2	23.536	23.536	35.2	147.12
<b>Per month Consumption in Kwh (Avg. 22 working day for departments and 30 days for street light). Projectors are not use for daily basis we assume projector may be used 10days/month)</b>		40550.4	52448	47261.63	296.8	11325.6	38156.8	1261.92	7989.7	29568	960	7056	706.08	706.08	1056	4413.6
<b>Per month Consumption at Summer Season in Kwh (April to October Total days of summer = 214 days we assume that total avg working days in summer season 120 days. For street lights total 214 days)</b>		221184	286080	257790.7	-	61776	208128	6883.2	43580.2	-	8217.6	50332.8	5036.704	5036.7	7532.8	31483.68

Per month Consumption at Winter Season in Kwh (November to March Total days of Winter =151 days we assume that total avg working days in summer season 120 days. Forstreet lights total 151 days)	221184	-	-	-	61776	208128	6883.2	43580.2	161280	5798.4	35515.2	3553.936	3553.94	5315.2	22215.12
Per year Consumption in Kwh (240 working days for light, water purifier, computer, 160 day for fan & AC, 120 days for geyser, 200 days for projector and 365 days for street lights)	442368	286080	257790.7	5936	123552	416256	13766.4	87160.3	151680	14016	85848	8590.64	8590.64	12848	53698.8

Load calculation of year 2022-2023	Unit in Kwh	Total Cost in Rs.
Total load consumption (Kwh) in summer season	1193062.368	13242992.28
Total load consumption (Kwh) in Winter season	778783.152	8480948.525
Total load consumption (Kwh) of 1 year	1971845.52	21723940.81

**Percentage of present Energy Consumption by various Electrical Appliances wise in the Year of 2022-2023 (Approx.)**

Equipment	Energy Consumption in Kwh/year (22-23)
Conventional Light	425088
Fan	257791
AC Machine	286080
Projector	5936
Photo-Copy Machine	123552
Geyser	151680
Computer/Laptop/Printer	416252
Water-Purifier	13766
LED tube + Bulb+Street Light	173008
Pump	83728.2

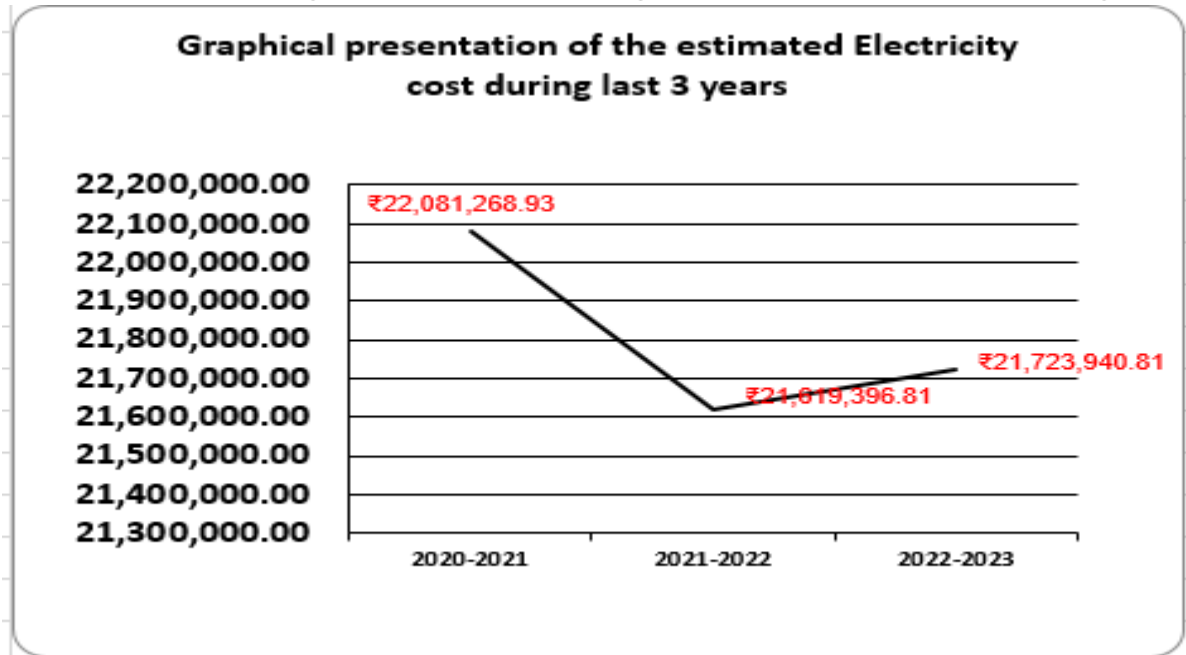
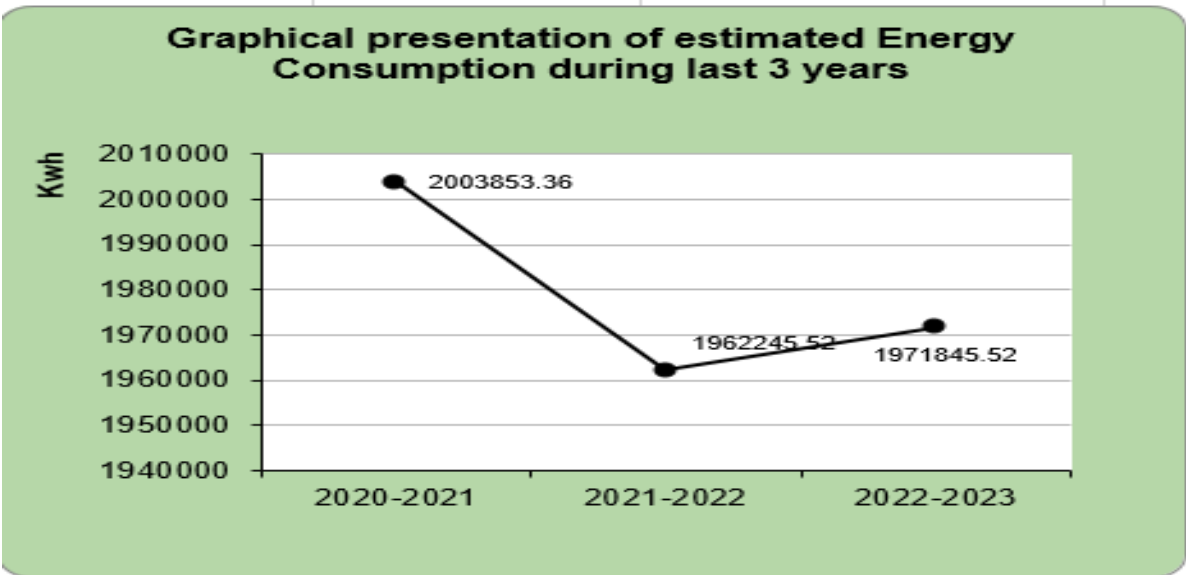




The number of LED bulbs in various departments in the University has increased during the last two years. The above chart and the similar charts for the previous two years reflect that the use of conventional light has decreased gradually.

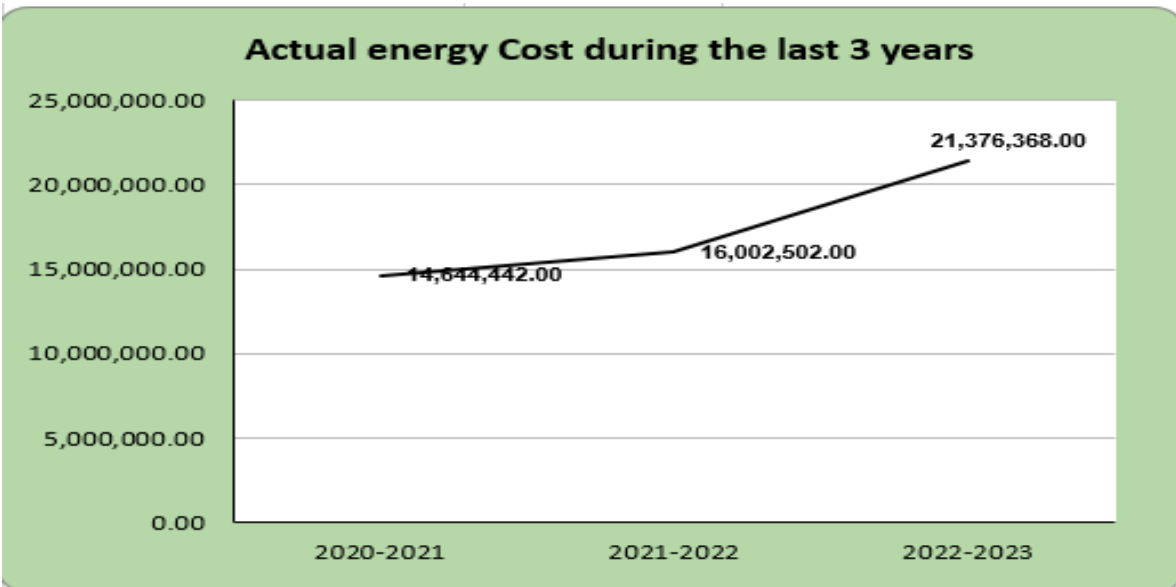
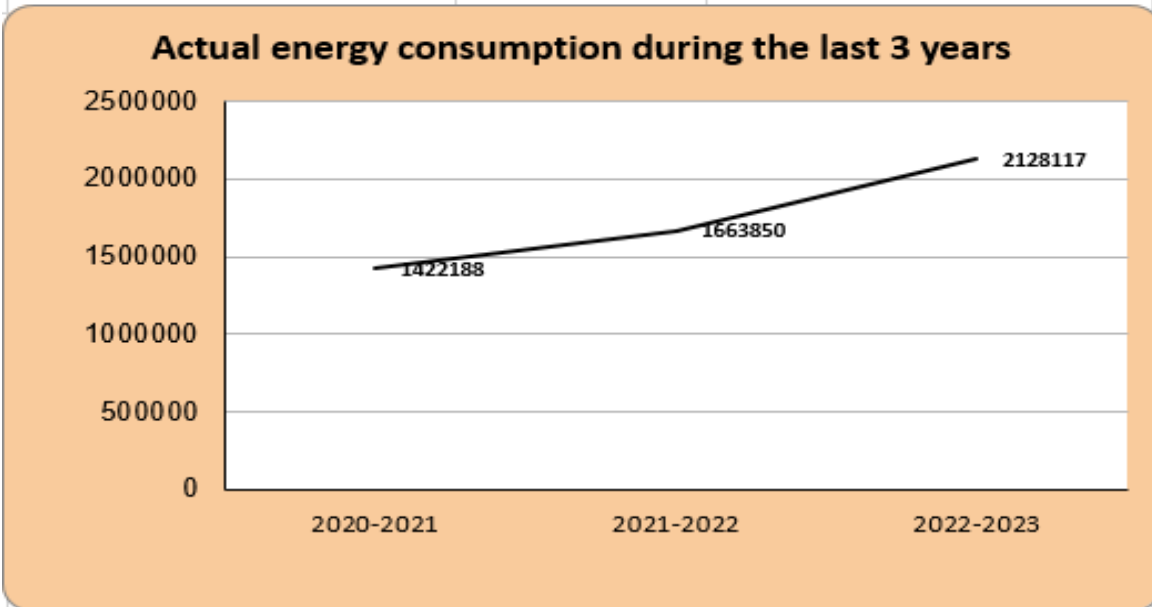
**Estimated Energy of Consumption and Electricity Cost (Approx.) during the last 3 years (2019-2023)**

YEAR	Kwh Per Year	Electricity Cost in Rs. Per year
2020-2021	2003853.36	22,081,268.93
2021-2022	1962245.52	21,619,396.81
2022-2023	1971845.52	21,723,940.81



The above figure shows the estimated approximate consumption and energy cost for the abovementioned equipment. It can be seen from the above figure that the consumption and annual energy costs are increasing with time.

Actual Energy Consumption and Electricity Cost during the last 3 years		
YEAR	KwH Per Year	Electricity Cost in Rs. Per year
2020-2021	1422188	14,644,442.00
2021-2022	1663850	16,002,502.00
2022-2023	2128117	21,376,368.00

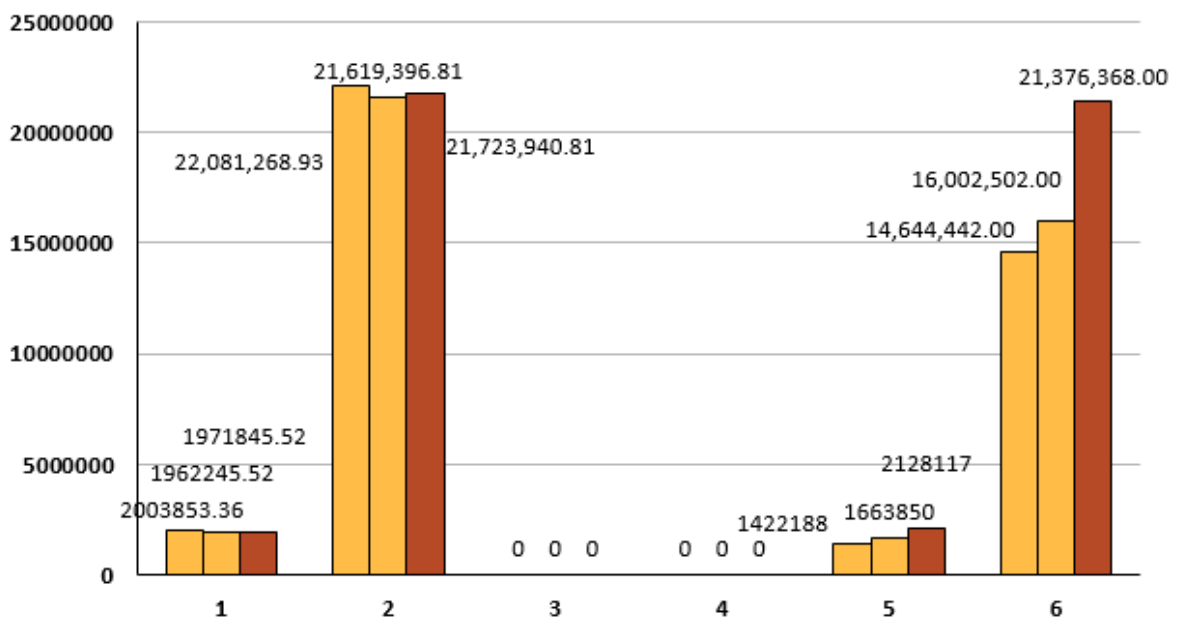


The above figure shows the actual consumption and energy bills of the University for the last three years. It was found that the consumption and energy costs for 2020-2021 and 2021-2022 were substantially lower, which seems to be due to the COVID-19 pandemic (the offline academic activities were suspended for a few months).

**Graphical chart of estimated vs Actual Energy Consumption and cost for the last 3 years**

YEAR	2020-2021	2021-2022	2022-2023
KwH Per Year	2003853.36	1962245.52	1971845.52
Electricity Cost in Rs. Per year (Approx)	22,081,268.93	21,619,396.81	21,723,940.81
KwH Per Year	1422188	1663850	2128117
Electricity Cost in Rs. Per year (Actual bill)	14,644,442.00	16,002,502.00	21,376,368.00

**Eastimated vs Actual Energy Consumption and Cost for the last 3 years**



The estimated and the actual consumption of electric energy during the last three years. Columns 1 and 2 describe the estimated energy consumption and cost, respectively, whereas columns 5 and 6 show the actual energy consumption and cost. The approximate or estimated consumption and the actual consumption of years 22-23 are nearly the same for the main campus NBU.

List of electrical appliance and equipment which are using at various academic departments and administrative building in year of 22-23 at NBU 2<sup>nd</sup> campus (Jalpaiguri).

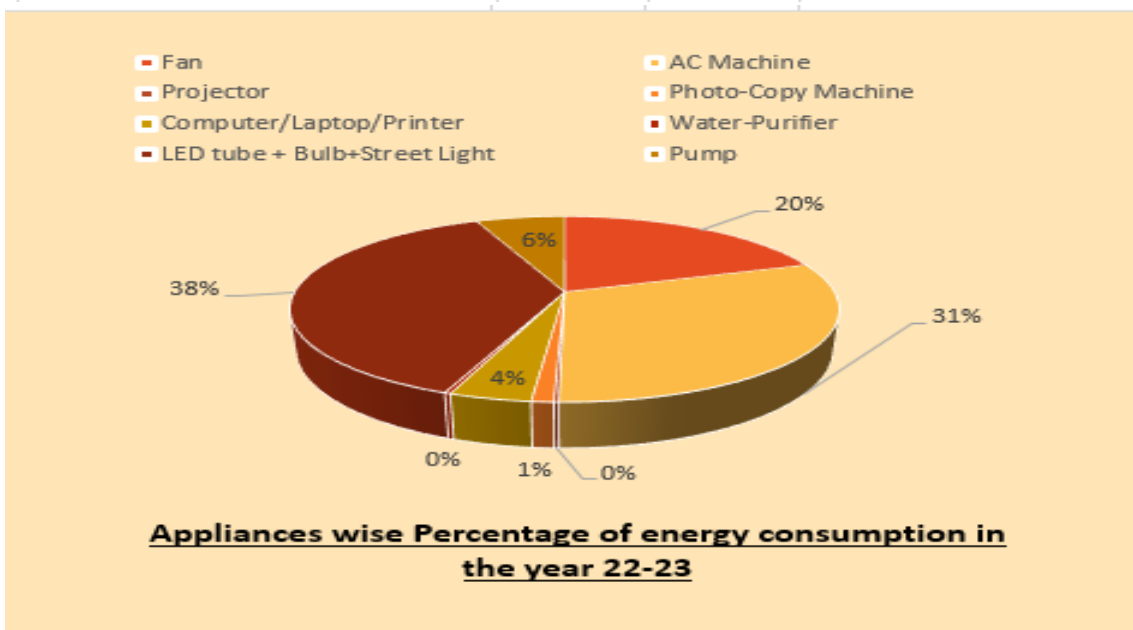
Details of the approximate load distribution at NBU main Campus										
YEAR 2022-2023										
Sl.No.	Department	No. of A/C	No. of Fans	No. of Projectors	No. of Photo-copiers	Computer s + Printers	Water Purifiers	LED tube+ bulb	LED Street light	5HP Pump
1	Arts Department	16	122	4	1	0	2	336	–	–
2	Science Department	16	122	4	1	0	2	336	–	–
3	Centres	16	100	0	2	12	2	300	–	–
4	Pump	0	0	0	0	0	0	2	–	2
13	Street Light	–	–	–	–	–	–	–	30	–
<b>Total</b>		<b>48</b>	<b>344</b>	<b>8</b>	<b>4</b>	<b>12</b>	<b>6</b>	<b>974</b>	<b>30</b>	<b>2</b>
Total Consumption in Watt		72000	23392	560	2600	2400	180	17532	2100	7355
Per day Consumption in Watt-hr (8 Hrs/ day). <i>(Projectors arenot use for 8 hrs per day we assume that may be used 2 hrs per day)</i>		288000	187136	1120	5200	19200	1440	140256	25200	29420
Per day Consumption in Kwh		288	187.136	1.12	5.2	19.2	1.44	140.256	25.2	29.42
Per month Consumption in Kwh <i>(Avg. 22 working day for departments and 30 days for street light). Projectors arenot use for daily basis we assume projector may be used 10days/month)</i>		6336	4116.992	11.2	114.4	422.4	31.68	3085.632	756	647.24
Per month Consumption at Summer Season in Kwh <i>(April to October Total days of summer = 214 days we assume that total avgworking days in summer season 120 days.For street lights total 214 days)</i>		34560	22456.32	1120	624	2304	172.8	16830.72	5392.8	3530.4
Per month Consumption at Winter Season in Kwh <i>(November to March Total days of Winter = 151 days we assume that total avg working days in summer seation 120 days . For street lights total 151 days)</i>		–	–	4480	624	2304	172.8	16830.72	3805.2	3530.4
Per year Consumption in Kwh <i>(240 working days for light,water purifier,computer, 160 day for fan &amp; AC, 120 days for geyser, 200 days for projector and 365 days for street lights)</i>		34560	22456.32	268.8	1248	4608	345.6	33661.44	9198	7060.8

Load calcution of year 2022-2023	Unit in Kwh	Total Cost in Rs.
Total load consumption (Kwh) in summer	86991.04	869910.4
Total load consumption (Kwh) in Winter season	31747.12	317471.2

Total load consumption (Kwh) of 1 year	118738.16	2747381.6
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**Percentage of present Energy Consumption by various Electrical Appliances wise in the Year of 2022-2023 (Approx.)**

Equipment	Energy Consumption in Kwh/year (22-23)
Fan	22456.3
AC Machine	34560
Projector	268.8
Photo-Copy Machine	1248
Computer/Laptop/Printer	4608
Water-Purifier	345.6
LED tube + Bulb+Street Light	42859
Pump	7060.8



In the above pie chart, it is shown that there are no conventional lights at the Jalpaiguri Campus; the whole campus is running with LED tube lights and street lights

## **Recommendations:**

1. The prevailing policy of replacing incandescent bulbs and fluorescent tube lights with energy-efficient light-emitting diode (LED) bulbs in a phase-wise manner is to be continued.
2. The existing practice of replacing old fans with new energy-efficient fans in a phase-wise manner is to be continued.
3. Master switches may be installed outside each of the classrooms/office rooms.
4. Awareness programs on saving energy may be arranged on a regular basis. "Energy club" may be formed at the University.
5. A few energy-efficient brushless direct current motor (BLDC) fans may be installed to test the performance.
6. Motion-sensor lights may be used in corridors, etc., at some places for performance testing.
7. Judicious use of air conditioners is necessary. Curtains to be used in AC rooms.
8. It is required to turn off electrical equipment when not in use.
9. It is required to maintain appliances and replace old appliances.
10. Installation of solar water heaters at university guest houses, hostels, and residential quarters may be initiated.
11. A 1000 KW grid-connected Solar Power Plant on the rooftop of various buildings of this University has been installed, but it is not yet functioning. The WBSEDCL and other concerned authorities may be approached for the early functioning of the solar power plant.

## **A special note:**

The university has 149 ACs of different types, including split, tower, and window types, which comprise a considerable part of the total energy consumption of the campus. But, in many places, it was found that ACs are not used with the best recommended energy-saving practices, such as insulation. Also, in certain areas, AC is used without curtains. These poor practices account for the increase in AC load and, thus, consumption.

Proper maintenance and cleaning of ACs are required regularly to make them work at their highest efficiency. Any dirt in the filter may reduce the efficiency of ACs very significantly. Also, if the ampere of an AC is found to be more than 12A, the AC machine must be replaced immediately.

The ACs should be switched on 15 minutes before actual use and should be switched off before leaving the room.

### **Saving calculation on replacement of LED lights**

Luminous efficacy is the measure of the number of lumens a bulb produces per watt i.e., how much visible light is produced compared to the power consumed. If we compare Crompton LED Battens against traditional tube lights, we get the following results:

- 40W tube light churns out approx. 1900 lumens for 36 watts.
- 18W Crompton LED Batten easily produces over 1800 to 2000 lumens for 18 watts.

An LED Batten consumes less than half the power to match the light produced by a conventional tube light.

