

ENERGY AUDIT REPORT YEAR: 2022-2023

DHSK COMMERCE COLLEGE

DIBRUGARH, ASSAM



Prepared By

Internal Quality Assurance Cell


DHSK Commerce College

Dibrugarh(Assam)

Audited By

M/s D.G. Electrical

Licence No:-3827


M/s D. G. Electricals
Hukuta, Duliajan
Regd. No. : 3827

1. Introduction

The task of conducting Energy Audit & Energy Management study for the DHSK Commerce College. The field work and data collections were carried out in April'2023. The study encompassed the examination of the existing pattern of energy use in the college and identification of areas where energy & monetary savings could be achieved by employing suitable techno-economic measures. This report gives the details of observations along with appropriate recommendations and supporting calculations and in bringing the energy consumption of the college to the lowest possible level.

2. Energy Auditing:-

Electrical energy audit is a process of checking how energy is used and identifying the areas where wastage can be minimized. It is done by reviewing of the historical data on energy consumption, which can be compiled from the electricity bills and economizing on the use of energy without adversely affecting economic growth and development. It includes the efficiency of energy extraction, transmission and distribution and increasing the productivity of energy used. For the successful implementation of an energy efficient campus, DHSK Commerce College has focused a lot on the enhancement and awareness among the students, teachers, and other members of the institution and also create a sense of responsibility among them.

3. Energy Sources:-

Electricity is the major energy sources of the college. Electricity is supplied by Assam Power Distribution Company Limited. Diesel oil is being used in the DG sets for in-house generation of electricity during power cut.

4. ELECTRICAL SUPPLY:-

The electricity supply for DHSK Commerce College is provided through 11 KV Naliapur feeder originating from 33/11 KV Sub-Station Kodomoni by Assam Power Distribution Company Limited. The energy consumed by DHSK Commerce College falls under HT IV Bulk Supply (Government Education) Category. The sanction Load is 60 KW and the Contract Demand is 71 KVA. The energy consumption of the whole campus is facilitated through a Transformer having rating of 100 KVA. The College also has 1 DG sets having capacity of 24 KVA respectively. The DG sets are mainly used during power failure from APDCL.

5. Consumer Details :-

Name Of The Consumer:- Principal DHSK Commerce College

Address :- K C Gogoi Path Dibrugarh, DIBRUGARH

Consumer No :-210000001210


Meter No :- APC07949

Connected Load :-60KW

Sanction Load :-60KW

Contract Demand :-71KVA

Load Security Paid :- 131629


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6. Load Details Of College:-

| Items | Load per Items (Watt) | No | Total Load (watt) |
|------------------------------|--------------------------|-------|----------------------|
| (i) | (ii) | (iii) | (iv) |
| CFL/LED tube light | 20 | 74 | 1480 |
| | 9 | 41 | 369 |
| BULB | | | |
| Tube Light | 40 | | |
| Ceiling Fan | 75 | 121 | 9075 |
| Wall Mount Fan | 60 | 26 | 1560 |
| Television | 110 | 3 | 330 |
| Smart Board | 95 | 3 | 285 |
| Electric Iron | 1000 | | |
| Fridge | 151 | 1 | 151 |
| Cooler | 250 | | |
| Heater | 1000 | | |
| Washing Machine | 750 | | |
| Geyser** | 2000 | | |
| Microwave Oven | 2000 | | |
| Air Conditioner (1 Ton)** | 1500 | 10 | 15000 |
| Air Conditioner (1.5 Ton)** | 2250 | | |
| Computer | 115 | 26 | 2990 |
| Printer | 150 | 12 | 1800 |
| Pump Set 0.5 HP | 375 | | |
| Pump Set 1 HP | 750 | 1 | 750 |
| Spare Plug Points* | a) 5 Amps | 100 | 4750 |
| | b) 15 Amps | 1000 | 15000 |
| Other On Actual | Projector | 105 | 1155 |
| | | | |
| Total | | | 54695 |
| Total | | | 54.70KW |

Note:-As per APDCL Norms.

- 1) 1/3rd of the total unused plugs in case of Domestic and General Purpose Supply and 50% (half) of the plug point of the commercial category shall be counted for computing connected load.
- 2) In case of Domestic category of consumers, the higher rating of only one equipment shall be considered for determination of connected load, if both Geyser and Air Conditioner (without heater) are installed and used for domestic purpose only.

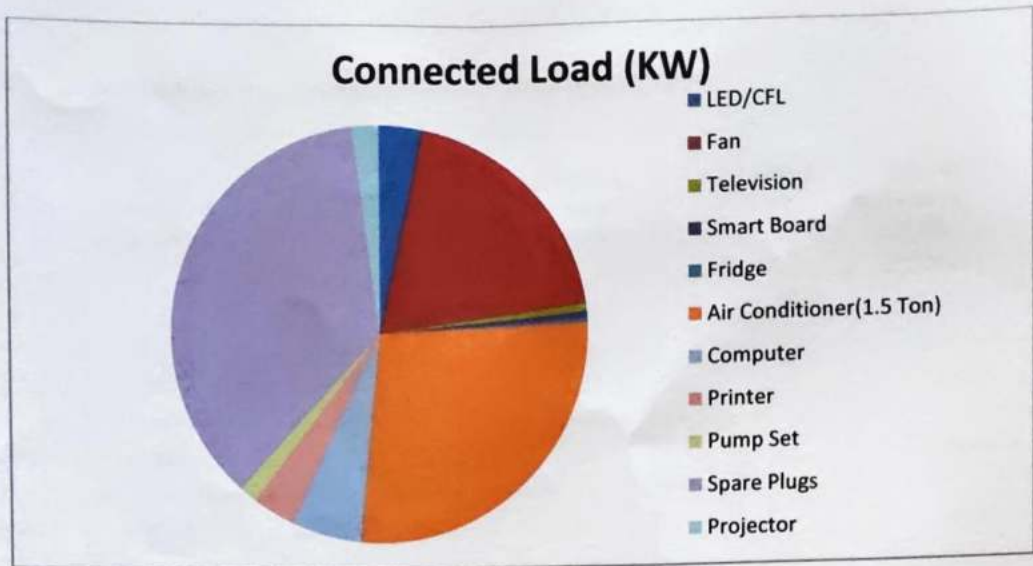
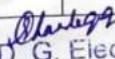


Fig. 1.1

7. I) Monthly Energy Consumption:-FY-2021-2022

| Month | Units Consumed In KWH | PF | PF Penalty/ Rebate | Maximum Demand In KVA | LT Metering Penalty (3% on 2) | Billable Units in KWh (2+4+6) |
|------------|-----------------------|------|--------------------|-----------------------|-------------------------------|-------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| April'2021 | 985.5 | 72.4 | 118.26 | 9.75 | | 1103.76 |
| May'2021 | 763.65 | 74.2 | 76.36 | 4.2 | | 840.01 |
| June'2021 | 1116.75 | 83.5 | 11.17 | 5.4 | | 1127.92 |
| July'2021 | 1448.85 | 87.5 | -14.49 | 10.2 | | 1434.36 |
| Aug'2021 | 1519.5 | 86.3 | -15.2 | 9 | | 1504.31 |
| Sept'2021 | 2036.4 | 92.9 | -20.36 | 17.4 | | 2016.04 |
| Oct'2021 | 2529.75 | 94.9 | -25.3 | 18.15 | | 2504.45 |
| Nov'2021 | 2801.85 | 93.7 | -28.02 | 14.85 | | 2773.83 |
| Dec'2021 | 2438.25 | 88.7 | -24.38 | 13.05 | | 2413.87 |
| Jan'2022 | 1279.65 | 74.3 | 127.97 | 5.85 | | 1407.62 |
| Feb'2022 | 1211.85 | 77.9 | 84.83 | 7.05 | | 1296.68 |
| March'2022 | 1580.4 | 81.4 | -56.63 | 12.3 | | 1627.81 |
| Total:- | 19712.4 | | | | | 14906.53 |


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ii) **Monthly Energy Consumption:-FY-2022-2023**

| Month | Units Consumed In KWH | PF | PF Penalty/ Rebate | Maximum Demand In KVA | LT Metering Penalty (3% on 2) | Billable Units in KWH (2+4+6) |
|------------|-----------------------|------|--------------------|-----------------------|-------------------------------|-------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| April'2022 | 1282.5 | 83.8 | 12.82 | 18.3 | | 1295.33 |
| May'2022 | 2120.25 | 91.6 | -21.2 | 22.8 | | 2099.05 |
| June'2022 | 2350.36 | 92.8 | -23.5 | 21.45 | | 2326.85 |
| July'2022 | 2550 | 91.4 | -25.5 | 20.4 | | 2524.5 |
| Aug'2022 | 2804 | 90.9 | -26.04 | 22.8 | | 2577.96 |
| Sept'2022 | 3071.4 | 92.0 | -30.71 | 22.35 | | 3040.69 |
| Oct'2022 | 1932 | 86.1 | -19.32 | 21.15 | | 1912.68 |
| Nov'2022 | 1459.5 | 79.2 | 72.97 | 14.1 | | 1532.47 |
| Dec'2022 | 1134.75 | 73.8 | 124.82 | 7.8 | | 1259.57 |
| Jan'2023 | 1337.1 | 76 | 120.34 | 7.35 | | 1457.44 |
| Feb'2023 | 1513.65 | 80.5 | 60.55 | 12.15 | | 1574.2 |
| March'2023 | 1545 | 81.5 | 46.35 | 16.05 | | 1591.35 |
| Total: | | | | | | |

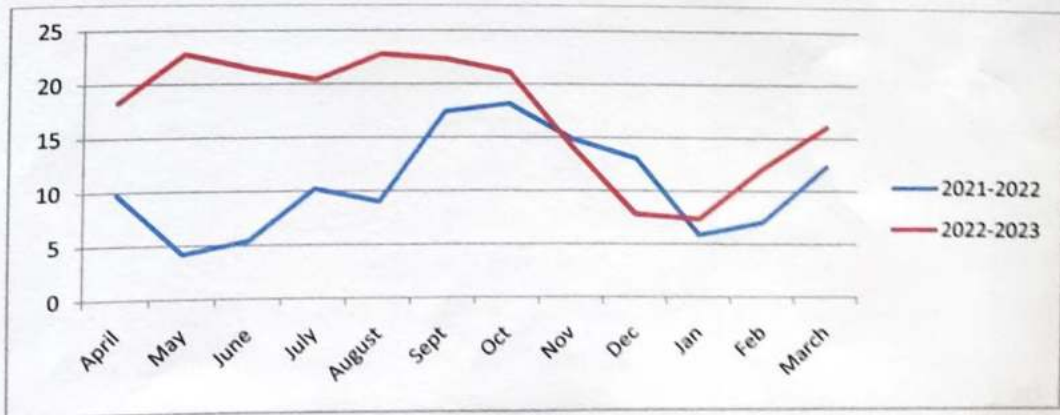


Fig.2.1 Maximum Demand recorded for the FY-2021-2022 Vs FY-2022-2023

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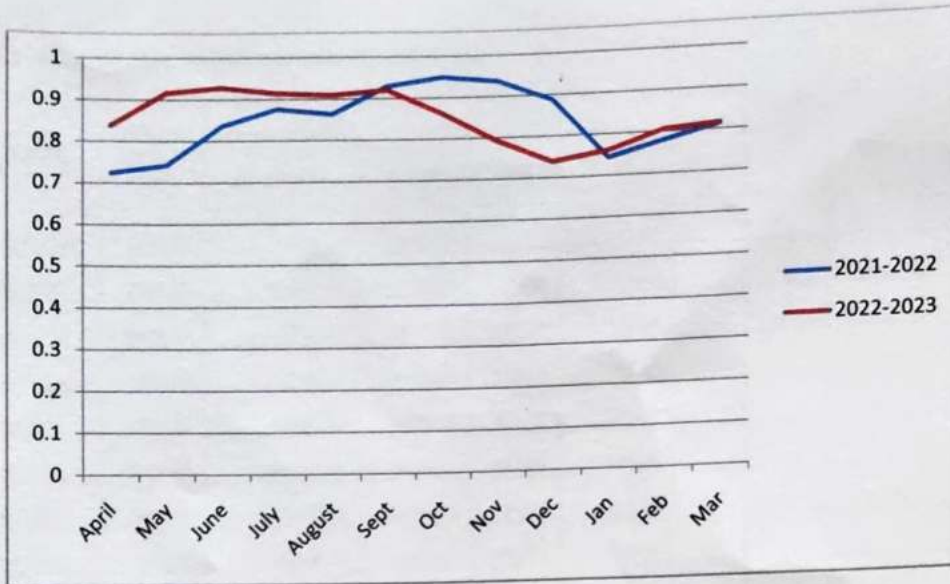


Fig.2.2 Power Factor recorded for the FY-2021-2022 Vs FY-2022-2023

8. I) Monthly Energy Bill analysis-FY-2021-2022

| Month | Billable Units in KWh | Energy Charge (Normal) @6.45/Unit | Demand/Fixed Charge (KVA) | Electricity Duty | Arrear Principal | Surcharge | | Adjustment Amount | Total Payable Amt |
|------------|-----------------------|-----------------------------------|---------------------------|------------------|------------------|-----------|---------|-------------------|-------------------|
| | | | | | | Arrear | Current | | |
| April'2021 | 1103.76 | 7119.25 | 9103.56 | 811.14 | | | 329.35 | | 17363.3 |
| May'2021 | 840.01 | 5418.06 | 9407.01 | 741.25 | | | 260.44 | | 15826.76 |
| June'2021 | 1127.92 | 7275.08 | 9103.56 | 818.93 | | | | | 17197.57 |
| July'2021 | 1127.92 | 7275.08 | 9103.56 | 818.93 | | | | | 17197.57 |
| Aug'2021 | 1504.31 | 9702.8 | 9407.01 | 955.49 | | | | | 20065.3 |
| Sept'2021 | 2016.04 | 13003.46 | 9103.56 | 1105.35 | | | | | 23212.37 |
| Oct'2021 | 2504.45 | 16153.7 | 9407.01 | 1278.04 | | | | | 26838.75 |
| Nov'2021 | 2773.83 | 17891.2 | 9103.56 | 1349.74 | | | | | 28344.5 |
| Dec'2021 | 2413.87 | 15569.46 | 9407.01 | 1248.82 | | | | | 26225.29 |
| Jan'2022 | 1407.62 | 9079.15 | 9407.01 | 924.31 | | | | 9654.98 | 11163.11 |
| Feb'2022 | 1296.68 | 8363.59 | 8496.66 | 843.01 | | | | | 17703.26 |
| March'2022 | 1627.81 | 10499.37 | 9407.01 | 995.32 | | | | | 20901.7 |
| Total:- | 19744.22 | 127350.2 | 110456.52 | 11890.33 | | 0 | 589.79 | 9654.98 | 242039.48 |

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ii) Monthly Energy Bill analysis-FY-2022-2023

| Month | Billable Units in KWh | Energy Charge (Normal) @6.45/Unit | Demand/Fixed Charge (KVA) | FPPA | Electricity Duty | Arrear Principal | Surcharge | | Adjustment Amount | Total Payable Amt |
|------------|-----------------------|-----------------------------------|---------------------------|---------|------------------|------------------|-----------|---------|-------------------|-------------------|
| | | | | | | | Arrear | Current | | |
| April'2022 | 1295.33 | 8743.48 | 9803.83 | | 927.37 | | | | | 19474.68 |
| May'2022 | 2099.05 | 14168.59 | 10130.63 | -104.95 | 1214.96 | | | | | 26409.23 |
| June'2022 | 2326.85 | 15706.24 | 9803.83 | -116.34 | 1275.5 | | | | | 26669.23 |
| July'2022 | 2524.5 | 17040.38 | 10130.63 | -126.23 | 1358.55 | | | | | 28403.33 |
| Aug'2022 | 2577.96 | 17401.23 | 10130.63 | 773.39 | 1376.59 | | | | | 29681.84 |
| Sept'2022 | 3040.69 | 20524.66 | 9803.83 | 912.21 | 1516.42 | | | | | 32757.12 |
| Oct'2022 | 1912.68 | 12910.59 | 10130.63 | 286.9 | 1152.06 | | | 491.36 | | 24971.54 |
| Nov'2022 | 1532.47 | 10344.17 | 9803.83 | 459.74 | 1007.4 | | | | | 21615.14 |
| Dec'2022 | 1259.57 | 8502.1 | 10130.63 | 377.87 | 931.64 | | | | | 19942.24 |
| Jan'2023 | 1457.44 | 9837.72 | 10130.63 | 728.72 | 998.42 | | | | | 21695.49 |
| Feb'2023 | 1574.2 | 10625.85 | 9150.25 | 787.1 | 988.8 | | | | | 21552.00 |
| March'2023 | 1591.35 | 10741.61 | 10130.63 | 795.67 | 1043.61 | | | | | 22711.52 |
| Total:- | 23192.09 | 156546.62 | 119279.98 | 4774.08 | 13791.32 | 0 | 0 | 491.36 | | 294883.36 |

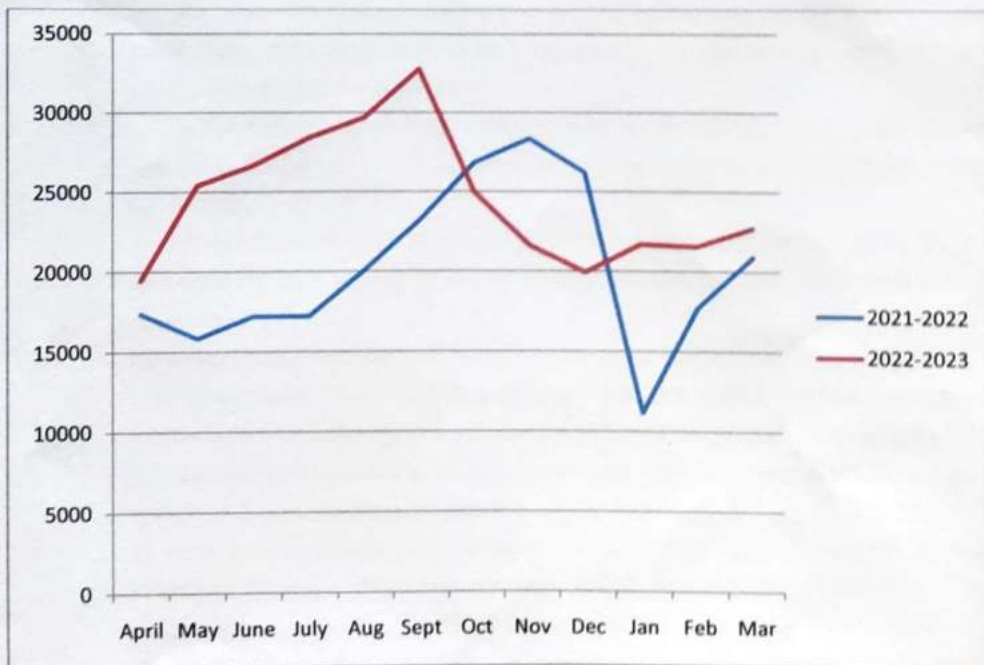


Fig.2.3 Total Energy Charge for the FY-2021-2022 Vs FY-2022-2023

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9. Recommendation.

9.1 Recommendation without investment.

According to the layout of the college and data analysis figure of the FY-2021-2022 and FY-2022-2023 some of the best energy saving tips was recommended which can save without any investment by proper utilization only in the electricity bills. Some of them are as follows:-

*Unplug and switch off the entire electrical device of appliance that not in used to reduce no load losses.

*Clean the light fixtures regularly as a heavy coat of dust can block 50% of light output.

*Clean the fans regularly as heavy coat of dust in fan blades reduce motor efficiency and output.

*Clean the Air conditioner duct and filter regularly to reduce the power consumption and increase cooling.

*Use the heavy load appliances in the non-peak load condition.

* By Making awareness among the students, teachers, and other members of the institution and also create a sense of responsibility among them is also an important role in saving energy.

9.2 a) Recommendation by following the terms and condition as per the schedule of Tariff of APDCL

* Power Factor Rebate/Penalty:-As per the schedule of Tariff of APDCL.

a) Power Factor Rebate

i) In case, the average PF(leading or lagging)maintained by the consumer is more than 0.85 and upto 0.95,a rebate of 1% on energy charges on unit consumption shall be applicable.

ii) For PF(leading or lagging)maintained by the consumer is more than 0.95 and upto 0.97,a rebate of 2% on energy charges on unit consumption shall be applicable.

iii) For PF(leading or lagging)maintained by the consumer is more than 0.97 and upto unity, a rebate of 3% on energy charges on unit consumption shall be applicable.

b)Power Factor Penalty:-

i. In case power factor (Leading or Lagging)in the month for the consumer falls below 0.85 a penalty @1% for every 1% fall in PF(leading or lagging) 0.85 to 0.60; 2% for every 2% for every 1% fall below 0.60 shall be levied on those consumers where PF is recorded electronically.

b) **Contract Demand**:-The contract demand shall be as per the agreement executed between the consumer and APDCL. In case declaration/option is not made by the consumer,100% of the connected load converted to KVA shall be the contracted demand.

c)**Billable Demand**:-Billing demand shall be 100% of contracted Demand or recorded Demand, whichever is higher. In case the meter remains defective in a month, billing demand shall be considered as per clause 6.3.4 of AERC(Electricity Supply Code)Regulations 2017,as amended from time to time.

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d) **Overdrawal Penalty**:-If the recorded demand is higher than the contracted demand in a month, then fixed charge base on contracted demand shall be levied at three times the normal rate for the portion of demand exceeding the contracted demand.

9.3 Recommendation with Investment:-

*It is recommended for the implementation of star rated appliances, such as replace the air conditioner, Fan, Motors etc. to 5 Star.

*It is recommended to switch over from conventional energy source of electricity to non conventional energy source of electricity as the campus has sufficient area for installation of solar panels.

10. Conclusions:-

- Considering the present scenario the un used spare plugs may be remove in order to reduce the connected load as well as reduce the no load losses.
- Considering the data of FY-2021-2022 and the Power Factor varies from 0.94 - 0.72 and the FY-2022 – 2023 varies from 0.92 -0.73 which is very poor. Hence the college should checked and improved the power Factor up to 0.97,so that college can avail the maximum rebate of 3% on unit consumption.
- Considering the data of FY-2021-2022 and FY-2022-2023 as the maximum demand tagger 22.8 KVA. At present the college availing 100% contract demand of 71 KVA ,hence as per schedule of Tariff amount involved for Demand/Fixed charge for 71KVA/month $= (71 \times 150 \times 12/365) \times 30 = 10504.11$. If new contract demand is execute considering the data of FY-2021-2022 and FY-2022-2023 (say 30 KVA) with the licensee than amount involved for Demand/Fixed charge is $= (40 \times 150 \times 12/365) \times 30 = 5917.80$. Amount save in Demand/Fixed charge per month $Rs(10504.11 - 5917.80) = 4586.31$ and the amount save per annum is $Rs(4586.30 \times 12) = 55035.72$ approximately.

11. Important Slogans:-

- Today's wastage is tomorrow's shortage
- The less you burn, the more you earn
- Live Green. Save Green
- Turn off the light when outside it's bright
- Save Today – Survive Tomorrow
- Save Energy means Save Money

Thank You

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1. Policy Document on environment from the auditing agency



वर्षा वन अनुसंधान संस्थान

भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद्
(पर्यावरण, वन एवं जलवायु परिवर्तन: मंत्रालय, भारत सरकार के अधीन एक स्वायत्त परिषद्)
पोस्ट बॉक्स नं. 136, जोरहाट - 785001, असम

RAIN FOREST RESEARCH INSTITUTE

Indian Council of Forestry Research & Education

(An Autonomous body of Ministry of Environment, Forest & Climate Change, Govt. of India)

Post Box No. 136, Jorhat- 785001, Assam



No. RFRI/FECC/ENV-AUD/2021/ ३५४

दिनांक/Date: 22/08/2022

सेवा में /To.

The Principal,
DHSK Commerce College,
Dibrugarh,
Assam, India

विषय/ Sub: 'Green and Environment Audit Report 2021-22' of DHSK Commerce College,
Dibrugarh - reg.

महोदय/Sir,

Please find the Inspection report on 'Green and Environment Audit Report 2021-22'
of DHSK Commerce College, Dibrugarh prepared by RFRI, Jorhat attached herewith.

भवदीय/Yours faithfully,

Rajib K. Borah
23.8.2022
(Dr. R. K. Borah)
Director



वर्षा वन अनुसंधान संस्थान RAIN FOREST RESEARCH INSTITUTE

भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद्

Indian Council of Forestry Research & Education

(पर्यावरण एवं वन मंत्रालय, भारत सरकार के अधीनस्थ एक स्वायत्त परिषद्)

(An Autonomous body under Ministry of Environment & Forest, Govt. of India)

No. RFRI/FECC/ENV-AUD/2021

दिनांक/Date: 10/08/2022

'Green and Environment Audit Report 2021-22' of DHSK Commerce College, Dibrugarh

The 'Green and Environment Audit Report 2021-22' prepared by the Green and Environment Audit Team, DHSK Commerce College, Dibrugarh was submitted to RFRI on 16 June 2022 for comments and suggestions. Accordingly, suggestions were given based on existing literatures and experience which was duly incorporated in the Green and Environment Audit Report 2022. In the next phase, on 04/08/2022, a team of RFRI visited the college for inspection of the works on ground. The team of three members including Dr. Dhruba Jyoti Das, Scientist E, Dr. Girish Gogoi, STO and Abhijit Medhi, TA visited the DHSK Commerce College and conducted a survey and inspection of the various management works mentioned in the 'Green and Environment audit report 2021-22'.

The Team met Dr. Khanindra Mishra Bhagawati, Principal of the college and other faculty members and discussed about the various works related to environment, importance of conservation and awareness among students, teachers and common people. The RFRI team was accompanied by Principal and team of faculty members including Mr. Pankaj Sahu, Assistant Professor, Dr. Bhupesh Bhagawati, Assistant Professor, Dr. Tulika Mattack, Assistant Professor and other faculties of DHSK Commerce college, Dibrugarh including Dr. Tanka Prasad Upadhaya, IQAC Coordinator, Dr. Nabajyoti Dutta, Assistant Professor, Dr. Ajit Goswami, Assistant Professor and Mrs. Bani Kachari, Assistant Professor. The RFRI team visited the various Water qualities, Air quality, Noise Pollution, Soil pollution, Human Health & Safety and Waste management systems operative in the college. The RFRI team visited the Vermicomposting project, Solar panels, Rain water harvesting units and other facilities installed in the campus.

Various plants (trees, shrubs and herbs) were planted in the campus from time to time for keeping the air in the campus pollution free and of good quality. Some of the important species found in the campus include *Mimusops elengi*, *Delonix regia*, *Mesua ferrea*, *Azadirachta indica*, *Mangifera indica*, *Nyctanthes arbor-tristis*, *Polyalthia longifolia*, *Terminalia arjuna*, *Terminalia chebula*, *Psidium guajava*, *Elaeocarpus floribundus*, *Phyllanthus emblica*, *Pinanga gracilis*, *Pinus Kesiya*, *Santalum album*, *Pterocarpus santalinus*, *Artabotrys siamensis*, *Ziziphus mauritiana*, *Murraya koenigii*, *Alstonia scholaris*, *Caesalipinia pulcherrima*, *Areca catechu*, *Juniperus Sabina*, *Ocimum sanctum*, *Terminalia arjuna*.

Syzygium cumini, *Nyctanthes arbor-tristis*, *Morinda citrifolia*, *Tinospora cordifolia*, *Chamaecostus cuspidatus*, *Aloe barbadensis*, *Dracaena trifasciata*, *Calliandra eriophylla*, *Polyscias fruticosa*, *Chlorophytum comosum* etc.

Various display boards located at important places were also checked. Dry and Wet dustbins in different locations of the college were also visited. In order to save and conserve energy college also use solar energy and LED bulbs have been found used in most of the classrooms, Principal's office, Teachers' common rooms, Administrative Office, Girls' Hostel, Computer Lab., and Departmental Rooms in the College. The other initiatives as mentioned in the Green Audit report were visited as well.

Some of the photographs of the visit and inspection are given below:



A view of the campus



Water filter and drinking water tank with taps



Rain Water Harvesting



Vermicomposting Project



Sanitary napkin incinerators



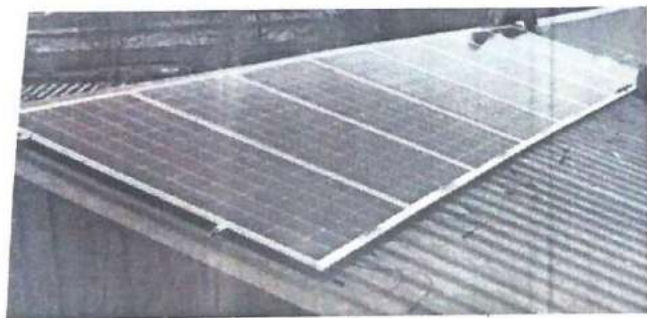
Maintenance of two types of dustbins



Dustbins made of bamboo used by the College



Discussion with the faculties



Solar Panel on the roof top



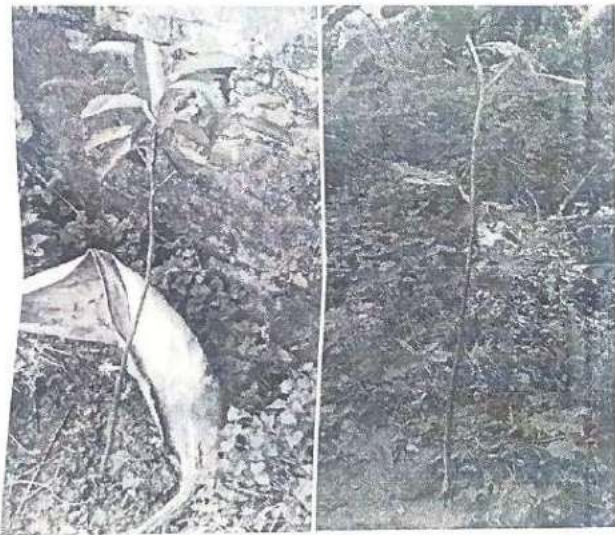
Green Campus Initiative (Natural Car Shed)



Photos of Plantation programmes of the College



A group photo with the Principal and faculty members



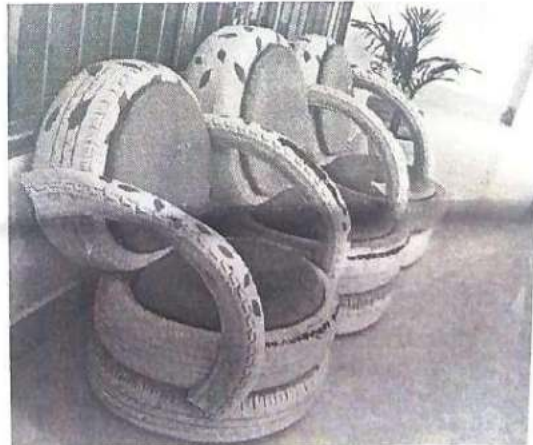
New saplings of Bokul and Rain tree



Natural Regeneration of Arjun tree



Green Campus Initiative- Indoor Plants




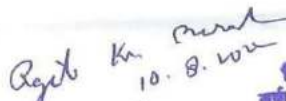
Chair made from used Car Tyre

The overall works as mentioned in the Green and Environment Audit Report 2021-22 were found satisfactory. The following recommendations are given to the Green and Environment Audit Team and college authority to be followed for further improvement in this regard.

Recommendations:

- (1) Name plate of trees in the campus having local and scientific name may be prepared and attached to each tree for the purpose of general awareness to the students.
- (2) The college is having three campuses with combined area of 1.82 ha. There are some areas where plantation of ecologically and economically important tree species with aesthetic value should be done.
- (3) Presently the college is having biomass carbon stock of 9.97 Mg from trees alone. Plantation of more trees in the boundary areas of Girls' hostel and Banipur campus will definitely increase the amount of carbon stock and overall carbon sequestration potential of the college campus.
- (4) Number of solar panel may be increased.
- (5) It is recommended that carbon foot print of the campus may be estimated and reported for green audit in next audit.
- (6) The college is having a vermi-compost unit which is presently non-functional. The existing vermi-compost unit should be made functional at the earliest and Compost organic fertilizer can be prepared from the wet garbage.
- (7) More awareness programmes on environment may be organised for students and general public from time to time.


Dr. Dhruba J. Das 10/08/2022
Scientist E/ Head FECC
RFRI, Jorhat
(Team leader)


Dr. R. K. Borah
Director
RFRI, Jorhat

निदेशक / Director
वर्षा वन अनुसंधान संस्थान
Rain Forest Research Institute
जोहाट (असम) / Jorhat (Assam)